The EDISON ELECTRIC INSTITUTE BULLETIN

In Two Sections — Section 1

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January 1955

Published Monthly by Edison Electric Institute

The Electric Industry in 1954
Harold Quinton

Power and Steel
Pressly H. McCance

Coal and Kilowatts
A. C. Monteith

Motivation of Employees' Behavior
J. P. Flemming

Four Utilities Jointly Plan for the Future
Calvin T. Hughes

EEI Resuscitation Awards

ELECTRICAL RESEARCH STATISTICS
THE ELECTRIC LIGHT AND POWER INDUSTRY

Current Statistical Data Covering 100 Per Cent of Industry

October, 1953-1954

SOURCE AND DISPOSAL OF ENERGY—MONTH OF OCTOBER

	1954	1953	%
NET GENERATION* (Kwhrs in Thousands)			
By Fuel Burning Plants	32,624,160	30,489,646	+ 7.0
By Water Power Plants	7,832,191	7,168,004	+ 9.3
Total Generation	**40,456,351**	**37,657,650**	**+ 7.4**
Add—Net Imports Over International Boundaries	250,675	80,594	.....
Less—Company Use	118,603	131,631	− 9.9
Less—Energy Used by Producer	690,580	491,172	+40.6
Net Energy for Distribution	**39,897,843**	**37,115,441**	**+ 7.5**
Lost and Unaccounted for	4,790,045	4,765,861	+ 0.5
Sales to Ultimate Customers	**35,107,798**	**32,349,580**	**+ 8.5**

CLASSIFICATION OF SALES

NUMBER OF CUSTOMERS—As of October 31			
Residential or Domestic	42,952,515	41,790,722	+ 2.8
Rural (Distinct Rural Rates)	1,638,489	1,623,754	+ 0.9
Commercial or Industrial:			
Small Light and Power	5,994,910	5,849,667	+ 2.5
Large Light and Power	281,960	275,019	+ 2.5
Other Customers	164,154	160,368	+ 2.4
Total Ultimate Customers	51,032,028	**49,699,530**	**+ 2.7**
KILOWATTHOUR SALES—During Month of October (Kwhrs in Thousands)			
Residential or Domestic	8,239,996	7,832,883	+11.6
Rural (Distinct Rural Rates)	894,123	869,699	+ 2.8
Commercial or Industrial:			
Small Light and Power	6,503,167	5,916,686	+ 9.9
Large Light and Power	17,385,022	16,177,686	+ 7.5
Street and Highway Lighting	361,505	345,038	+ 5.6
Other Public Authorities	806,953	768,125	+ 5.1
Railways and Railroads:			
Street and Interurban Railways	202,911	226,041	−10.2
Electrified Railroads	155,725	166,951	− 6.7
Interdepartmental	53,596	46,471	+18.1
Total to Ultimate Customers	35,107,798	**32,349,580**	**+ 8.5**
Revenue from Ultimate Customers (Thousands)	$618,364	**$572,424**	**+ 8.0**

RESIDENTIAL OR DOMESTIC SERVICE

AVERAGE CUSTOMER DATA—For 12 months ended October 31, 1954			
Kilowatthours per Customer	2,512	2,317	+ 8.4
Average Annual Bill	$67.82	$63.72	+ 6.4
Revenue per Kilowatthour	2.70¢	2.75¢	− 1.8

* By Courtesy of the Federal Power Commission.

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The objectives of the Edison Electric Institute are:

The advancement in the public service of the art of producing, transmitting, and distributing electricity and the promotion of scientific research in such field.

The ascertainment and making available to the members and the public of factual information, data, and statistics relating to the electric industry.

To aid its operating company members to generate and sell electric energy at the lowest possible price commensurate with safe and adequate service, giving due regard to the interests of consumer, investor, and employee.

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The EDISON ELECTRIC INSTITUTE BULLETIN

January, 1955

Vol. 23 No. 1

Articles, Speeches, Reports

The Electric Industry in 1954
Harold Quinton 3

Power and Steel
Pressly H. McCance 5

Coal and Kilowatts
A. C. Monteith 7

Motivation of Employees' Behavior
J. P. Flemming 11

Four Connecticut Utilities Jointly Plan for the Future
Calvin T. Hughes 15

EEI Resuscitation Awards 22

Fatal Accidents in the Electric Light and Power Industry
S. H. Young 27

News, Notes, Miscellany

Conventions and Meetings 2

Program Announced for Street Tree and Utility Conference to be Held March 3-4..... 10

I Want to Know About the Electric Industry, 1954-1955 Edition, Now Available 10

Six 1955 National Appliance Campaigns Outlined by EEI.. 21

Texas Power & Light Co. Receives Ebasco's Gold Award.. 25

Over 200 Attend Second Electronics Accounting Machine Seminar 26

EEI Publication 26

41 EEI Safety Merit Awards Presented in Last Five Months of 1954 28

Personals 31

CONVENTIONS AND MEETINGS

1955

FEBRUARY

3- 4 EEI Commercial Cooking and Water Heating Committee, Hotel William Penn, Pittsburgh, Pa.
3- 4 Missouri Valley Electric Association, Industrial and Commercial Sales Conference, President Hotel, Kansas City, Mo.
9-10 EEI Accident Prevention Committee, Shoreham Hotel, Washington, D. C.
9-11 EEI-AGA Taxation Accounting Committees, Capt. Shreve-Washington Youree Hotels, Shreveport, La.
10 EEI Home Service Committee, Potomac Electric Power Co. office, Washington, D. C.
10-11 EEI Transmission and Distribution Committee, Shoreham Hotel, Washington, D. C.
10-11 PEA Transmission and Distribution Committee, Hotel Roosevelt, Pittsburgh, Pa.
14 EEI Industrial Relations Committee in conjunction with AGA at AMA Mid-Winter Personnel Conference, Palmer House, Chicago, Ill.
14-15 EEI Electrical Equipment Committee, Deshler Hilton Hotel, Columbus, Ohio.
14-15 PEA Prime Movers Committee Winter Meeting, Roosevelt Hotel, Pittsburgh, Pa.
15-16 EEI-AGA Depreciation Accounting Committees, Palmer House, Chicago, Ill.
15-16 PEA Relay Committee, Hotel Roosevelt, Pittsburgh, Pa.
15-16 EEI-AGA Plant Accounting and Property Records Committee, Edgewater Beach Hotel, Chicago, Ill.
17-18 EEI Commercial Electric Space Heating and Air Conditioning Committee, Terrace Plaza Hotel, Cincinnati, Ohio
17-18 EEI-AGA 1955 Accounting Conference Planning Meeting, Edgewater Beach Hotel, Chicago, Ill.
17-18 PEA Electrical Equipment Committee, Benjamin Franklin Hotel, Philadelphia, Pa.
20-21 EEI Residential Promotion Committee, EEI Headquarters, New York, N. Y.
23-24 Pacific Coast Electrical Association Conference on Electronic Integrated Data Processing, Hotel Statler, Los Angeles, Calif.
24-25 PEA Systems Operation Committee, Abraham Lincoln Hotel, Reading, Pa.
24-25 11th Annual National Adequate Wiring Conference, La Salle Hotel, Chicago, Ill.

MARCH

3- 4 Street Tree and Utility Conference, sponsored by EEI Transmission & Distribution Committee, IES Street Lighting Committee, and National Shade Tree Conference, shade Tree Selection Committee, Wade-Park Manor Hotel, Cleveland, Ohio.
6- 9 North Central Electric Association, Sales Committee Meeting, Radisson Hotel, Minneapolis, Minn.
7- 8 Pacific Coast Electrical Association Engineering and Operating Section Conference, Hotel Huntington-Sheraton, Pasadena, Calif.
13-18 NEMA, Edgewater Beach Hotel, Chicago, Ill.
16-17 EEI Insurance Committee, Jung Hotel, New Orleans, La.
17 EEI Industrial Relations Committee, Washington, D. C.
18-20 ASME Spring Meeting, Lord Baltimore Hotel, Baltimore, Md.
21-23 Southeastern Electric Exchange, Annual Meeting, Boca Raton Hotel and Club, Boca Raton, Fla.
23-25 Missouri Valley Electric Association, Engineering Conference, President Hotel, Kansas City, Mo.
24-25 Oklahoma Utilities Association Convention, Mayo Hotel, Tulsa, Okla.

1955

28-31 21st Annual EEI Sales Conference, Edgewater Beach Hotel, Chicago, Ill.
30-Apr. 1—American Power Conference, Chicago, Ill.

APRIL

6- 7 15th Annual Young Men's Utility Conference, Ipalco Hall, Indianapolis, Ind.
7- 8 Pacific Coast Electrical Association Joint Conference, Administrative Services and Accounting Section, PCGA, Jokake Inn, Phoenix, Ariz.
7- 8 Southeastern Electric Exchange Engineering and Operating Section, Roosevelt Hotel, New Orleans, La.
13-15 Northwest Electric Light and Power Association, Engineering and Operation Section, Davenport Hotel, Spokane, Wash.
17 Rocky Mountain Electrical League Annual Spring Conference, Shirley Savoy Hotel, Denver, Colo.
18-21 ASME Spring Meeting, Lord Baltimore Hotel, Baltimore, Md.
21 EEI Industrial Relations Committee, EEI Headquarters, New York, N. Y.
24-27 Rocky Mountain Electrical League Spring Conference, Shirley Savoy Hotel, Denver, Colo.
25-27 EEI-AGA 1955 National Conference of Electric and Gas Utility Accountants, Conrad Hilton Hotel, Chicago, Ill.
25-27 EEI Meter and Service Committee, Washington-Duke Hotel, Durham, N. C.
25-28 North Central Electric Association, Engineering Committee, Dyckman Hotel, Minneapolis, Minn.

MAY

3- 4 EEI Transmission and Distribution Committee Meeting, Statler Hotel, Detroit, Mich.
8-11 EEI Purchasing and Stores Annual Spring Meeting, Dinkler Tutwiler Hotel, Birmingham, Ala.
9-10 EEI Prime Movers Committee, Biltmore Hotel, Los Angeles, Calif.
9-10 EEI Accident Prevention Committee, Pfister Hotel, Milwaukee, Wis.
9-11 Northwest Electric Light and Power Association, Business Development Section, Hotel Utah, Salt Lake City, Utah.
11-13 Pacific Coast Electrical Association Annual Convention, Palace Hotel, San Francisco, Calif.
19-20 EEI Industrial Relations Committee jointly with Personnel Administrative Section, Southeastern Electric Exchange, Netherlands Plaza, Cincinnati, Ohio.
19-20 PEA Electrical Equipment Committee Meeting, Hotel Roosevelt, Pittsburgh, Pa.
27-28 North Central Electrical Association, Accounting Committee, Fergus Falls, Minn.

JUNE

5-10 ASME Oil and Gas Power Conference, Statler Hotel, Washington, D. C.
13-16 EEI ANNUAL CONVENTION, Los Angeles, Calif.
22-24 Northwest Electric Light & Power Association Accounting and Business Practice Section, Vancouver Hotel, Vancouver, B. C.
22-24 CEA Annual Convention, Victoria, B. C.
26-29 Michigan Electrical Association Annual Convention, Grand Hotel, Mackinac Island, Mich.
26-28 Wisconsin Utilities Association Accounting Section, Dell View Hotel, Lake Dalton, Wis.

The EDISON ELECTRIC INSTITUTE
BULLETIN

The Electric Industry in 1954

By Harold Quinton

President, Southern California Edison Company and President, Edison Electric Institute

THE year 1954 was a notable year in the electric industry. The Diamond Jubilee year of the electric light, it marked 75 years of amazing growth and change since Thomas A. Edison's great discovery. The industry's 50 millionth customer was added in January. The five millionth farm was connected up for electric service a few weeks later. On the very anniversary day of the incandescent lamp, October 21, the country's 100 millionth kilowatt of generating capacity was put into operation at the St. Clair, Mich., plant of The Detroit Edison Co.

More new generating capacity was added than ever in the country's history—11.5 million kw of capability, well above the previous high of 10.1 million kw in 1953. The year 1954 saw the biggest output of electricity.

Atomic Power Developments

Ground was broken, September 6, at Shippingport, Pa., for the nation's first full-scale power plant which will use atomic fuel. Duquesne Light Co. will finance and build the generating portion of the plant, Westinghouse Electric Corp. will build the nuclear reactor, under contract with the Atomic Energy Commission, and Duquesne Light Co. will operate the entire plant.

Many groups of power companies in different sections of the country, including the Pacific Northwest, were actively studying atomic power developments with a view to proceeding with such undertakings as fast as circumstances warrant.

The projected building of the first 5000-psi and 1200-F steam boiler was announced by the Philadelphia Electric Co., and the projected building of the first 300,000-kw generator was announced for its River Rouge Plant by The Detroit Edison Co.

Companies Go Forward in Hydroelectric Developments

Congress acted to permit the Alabama Power Co. to obtain a license from the Federal Power Commission to build five hydroelectric plants on the Coosa River with 360,000 kw of capacity to take the place of proposed future developments on this river by the Federal government. A group of four companies in the Pacific Northwest combined and obtained from the Federal Power Commission permits to prepare plans for the development of two large hydroelectric projects on tributaries of the Clearwater River. This group has also requested permits to study developments on the Snake River below Hells Canyon, where the Idaho Power Co. is now applying for a license to build three large hydroelectric plants.

Power companies in the Northwest are seeking participation with the Federal government in the development of sites on the Columbia River. In other parts of the country licenses or preliminary permits have been obtained or are being sought from the Federal Power Commission for hydroelectric developments.

AEC-MVGC Contract

Another significant development of the year was the signing by the Atomic Energy Commission and the Mississippi Valley Generating Co., formed by Middle South Utilities, Inc., and The Southern Co., of a contract for the latter to build a plant at West Memphis, Ark., to supply 600,000 kw for that Commission. Although this was the third such contract developed by privately owned power companies, it was the first to meet strenuous opposition. This opposition, as it turned out, was plainly motivated by the fear by proponents of continued expansion into the commercial power business by the Federal government that the contract would jeopardize further appropriations from the Federal Treasury to pay for added steam generating capacity for TVA.

Companies Ask Removal of Legislative Inequities

Another development of the year was the presentation by investor-owned power companies at hearings before a Task Force of the Hoover Commission, asking for the removal of serious inequities in Federal legislation discriminating against their customers. Particularly, relief is being sought against discrimination in tax legislation which requires one class of American citizens, the customers of investor-owned power companies, to share the heavy cost of the Federal government through their electric bills and exempts another class, those served by governmental power agencies, from sharing in this cost through their electric bills. The tax law as it now stands constitutes a heavy and an unjustifiable discrimination against free enterprise.

Striking Gains in Operating Efficiencies

The continuing gains in operating efficiencies of electric companies were strikingly demonstrated during the year. As one example: out of the same size coal pile used by the electric industry last year the industry produced 28,000,000,000 more kilowatt-hours than in 1953, an 8.2 per cent

gain. This amount gained from efficiency improvement is equal to more than half of the total kilowatthour production 30 years ago.

Generating units on the average have doubled in capacity over prewar installations. This has been an important factor in keeping down unit costs.

Forecast for the Future

The industry's Diamond Jubilee year also produced an extensive survey and forecast for the future which indicates that by the year 1965 demand for electric power will be double that of today, and that by 1975 a three- or even four-fold increase in the use of electric energy by the homes, farms, stores and factories of our nation is expected.

To keep up with increasing electrical demand, the survey indicates the industry must plan to add from 7,000,000 to 12,000,000 kw of new generating capacity each year between now and 1965. After 1965, the requirements for new capacity to take care of load growth may be from 11,000,000 to 24,000,000 kw a year.

The survey estimated that generating plants using atomic energy as fuel will total one to two million kilowatts of capacity within the next ten years, and that by 1975 we might have from 40 to 65 million kw of atomic power plants, of an expected total capability of 301 to 423 million kw of generating capability.

Electricity Generation

Generation of electricity by the entire electric industry (companies, cooperatives and governmental agencies) was 471 billion kwhr in 1954, an increase of 29 billion over the preceding year. An additional 73 billion kwhr was produced by industrial and railway plants, bringing the grand total to 544 billion kwhr produced in the United States.

Construction—Power Supply

Eleven and one-half million kilowatts of generating capability were added during the year. This record-breaking total exceeded all installations made during the whole of the ten years preceding the outbreak of the second World War. Of the total, 8,100,000 kw was installed by the investor-owned companies and the remainder by cooperatives and governmental agencies. The new installations brought the total installed generating capability of the industry at the end of 1954 to approximately 107,000,000 kw.

For the country as a whole the gross margin between generating capability and peak power demand in 1954 was 17,700,000 kw or 19.8 per cent, as compared with 14,300,000 kw or 17.6 per cent in 1953. Growth in December peak demand was 10 per cent, as compared with 7.6 per cent in 1953 and 7.1 per cent in 1952.

During the year an adequate supply of power was maintained in all sections of the country.

Construction Expenditures

Construction expenditures by the investor-owned companies totaled $2,800,000,000 in 1954, as compared with $2,876,000,000 in 1953. The 1955 construction budget is likewise $2.8 billion.

Construction expenditures of the electric companies from the end of World War II to the end of 1954 totaled $18.5 billion.

Financing the Construction Program

Money to finance the year's construction program of the electric companies totaled $2,800,000,000. Approximately $1.8 billion of the 1954 total was obtained from the sales of securities and the remainder was drawn from depreciation reserves and surplus accruals. Bond sales in 1954 totaled $1,200,000,000, common stock $350,000,000 and preferred $250,000,000.

Investment in plant and property of the electric companies was approximately $28 billion at the end of 1954, as compared with $12.5 billion in 1945.

Construction Scheduled for 1955

Construction in 1955 is expected to exceed the record-breaking level attained in 1954. Thirteen million kilowatts of generating capability is scheduled for the entire electric industry in 1955, of which 8,000,000 kw is planned by the investor-owned companies. The addition of this amount to present capability will bring total installations to 120,000,000 kw of generating capability. Generating capability at the end of World War II was about 50,000,000.

Electricity sales by the electric industry totaled 409.5 billion kwhr in 1954, an increase of 25 billion over 1953, or 6.6 per cent. Sales to industrial customers totaled 197.5 billion kwhr, a 3.9 per cent increase over 1953, residential sales were 108.1 billion kwhr, an 11.4 per cent increase, and to commercial customers, 74.9 billion kwhr, an 8.1 per cent increase. Sales to other customer categories totaled 29 billion kwhr.

New Customers

By the end of the year 51,200,000 customers were being served by all components of the electric industry. One million, three hundred thousand were added during 1954. Electricity is now in reach of nearly every American home, with about 98 per cent of occupied homes, both urban and rural, enjoying electric service. Growth in number of customers during the year was due mainly to construction and population increase.

Electricity in the Home

Average consumption of electricity in the home *increased* by 194 kwhr per domestic customer, the largest annual gain on record. Total average use by the householder was 2540 kwhr for the year. Sales to domestic customers alone in 1954 were greater than the total sales to all classes of customers only 15 years ago.

Use of electricity by domestic consumers now accounts for 26.4 per cent of all electricity sales. The continually increasing importance of electric service in the home is indicated by these comparisons: In 1946 the percentage was 20.2. Twenty-five years ago domestic sales were 13 per cent of the total sales, or one-half of the present percentage.

Cost of Domestic Electricity

The very substantial increasing use of electricity in homes brought the average revenue per kilowatthour sold to domestic customers to 2.69 cents, as compared with 2.74 cents in 1953. The decrease was due to the promotional character of rate schedules, which, in effect, apply the ancient rule of the more you buy, the less the average unit cost.

Starting at 25 cents per kwhr in 1882, the average price to domestic customers was 10.5 cents in 1907. It was down to 5.6 cents per kwhr in 1932 and 4 cents in 1939. Earlier reductions resulted largely from technical advances in electricity supply. In more recent years, the reductions came

(*Continued on page* 26)

Power and Steel

By Pressly H. McCance
President, Duquesne Light Company

An address before the Electric Furnace Steel Committee of American Institute of Mining and Metallurgical Engineers, Pittsburgh, Pa., December 2, 1954

THE partnership of power and steel has contributed much to the great industrial expansion which has made our country the most important nation in the world. The two words "Power" and "Steel" represent the industrial might of our nation, and the industries they represent are so entwined that it would be virtually impossible to have one in its present state without the existence of the other.

Without steel there would be no electric power industry today. Without steel we could not have the furnaces, the boilers, the turbo-generators, the condensers, the steel structures and towers and countless other steel items which are so necessary in the operation of a present-day electric utility system. Conversely, without power there would be no great steel industry of today. Electric power handles your ore, loads your blast furnaces, tilts your open hearths, melts your steel in electric furnaces, moves your billets, rolls your tin plate, draws your steel tubes, stamps out your various forms, lights your plants, cools your offices and performs hundreds of other operations in your vast and complicated industrial operation.

Early Milestones

And we are proud of the part Pittsburgh has played in the development of this power-steel partnership. Back in 1886, through the inventive genius, wisdom and efforts of George Westinghouse, the first alternating-current system in the country was put into operation in Pittsburgh. This made possible, to a large degree, the great electric utility industry of today which delivers to you one of the most important ingredients in the production of electric steel. Back as early as 1908 Pittsburgh also pioneered in one of the first installations of electric furnaces for the production of electric steel, a small 500-kw furnace at the Firth Sterling Steel Co. in McKeesport.

It is important to note that in this area we have one of the largest electric manufacturing companies in the world — the Westinghouse Electric Corp. — producing equipment for both the electric utility industry and the steel industry. Here also there are three leading electric furnace manufacturing companies — the American Bridge Co., manufacturing the Heroult Furnace, the Pittsburgh Lectromelt Furnace Corp., manufacturing the Lectromelt Furnace, and the Swindell-Dressler Corp., manufacturing the Swindell Furnace. Therefore, Pittsburgh, past and present, was and is a very important factor in both our industries.

Story of Steel Is Story of Heat

As you know, the story of steel is the story of heat. Heat is constantly required to make ore into iron, iron into steel and steel into the finished products needed for industrial and commercial uses. Heat was first obtained in the steel industry from charcoal, later from coke, and in more recent years from gas and oil. Since the turn of the century, electricity has been used more and more. This is because *no other form of heat can be so easily concentrated, so carefully controlled and so efficiently used to give such high temperatures as can electric heat.* It has been asserted that the electric furnace is about 70 per cent efficient as a user of heat, compared to some only 25 per cent efficiency of the open hearth. It is little wonder, therefore, that electric heating is so rapidly becoming of greater and greater importance, not only in the steel industry, but in other manufacturing processes as well.

Statistics show that electric-furnace steel is making considerable progress in this country. I am told that in 1938 1,500,000 tons was made in electric furnaces. In 1953 this figure increased to something over 8,000,000 tons, a gain of more than 500 per cent. I have also been informed that while originally electric furnaces made mostly high-quality alloy and stainless steel, today some ordinary carbon steel is being made in these electric furnaces. Furthermore, I understand many steel operators believe that in the future electric furnaces will be used more and more in the steel-making process, rather than open-hearth furnaces.

Electricity in Manufacturing

Increased electrification in the steel industry in the future is not a strange forecast. During the last ten years the electric utility industry has practically doubled the sale of electricity to its consumers, due to more complete electrification in the home, in commercial establishments and in industrial plants. This result was possible only because of the benefits which accrued to its customers from the additional use of appliances, equipment and lighting. It is interesting to note that the average annual kilowatthours per worker in manufacturing industries has increased during the last ten years from about 10,000 kwhr per year to 17,000 kwhr per year.

In other words, ten years ago each manufacturing worker, through the help of electricity, had the assistance of approximately 7½ hp. And today that worker has the equivalent of 12 hp. That the results of such assistance improve the opportunities of the worker, the owner and our standard of living is obvious.

Recently the General Electric Co. and the Westinghouse Electric Corp. made a careful survey of the residential, commercial and industrial markets, and independently forecast that the use of electricity ten years hence would be double that of 1954.

Recently our Sales Department showed me a report published in July, 1953, by the Battelle Memorial Institute on the "Competitive Economics of Open Hearth and Electric Furnaces for the Production of Low

Carbon Steel." Some of the figures in this report are interesting in pointing up relative costs in the steel industry and the electric utility industry, particularly as they relate to capital investment. The report shows that the estimated capital cost of an electric-furnace shop designed to produce 500,000 tons of ingots annually (at 1952 price levels) would be $10,500,000. This estimate involved the construction of a completely new plant built from the ground up. If the new electric furnaces were replacing open-hearth furnaces in present buildings where other present associated equipment could be used, then the cost of installing the electric furnace, it was estimated, would probably be less than one-third of this amount. In either event, such a plant would probably place a load of 50,000 to 60,000 kw on a utility system.

To provide the production and transmission facilities to serve this load would require the investment by the utility of $10 million to $12 million—or the same amount as the steel industry would invest for a completely new electric-furnace plant, and three or four times as much as the steel industry would invest in a plant which had some present facilities available to accommodate the new furnaces.

Power and Steel Industries Alike

To meet the growing demands which will be placed upon us, the electric utility industry plans to continue to expand its facilities. From the birth of that industry 75 years ago it has had a tremendous growth, and two of the major factors behind this growth have been the reliability of the service and its low cost. In the future—as in the past—we intend to explore all methods of producing and distributing electricity, in order that we can keep the service both dependable and as low in price as possible. Like your industry, we are a privately owned business-managed industry with a very basic obligation to pay a fair return to our security holders who have invested money in the business. Profits are just as essential in our industry as in yours, so that we can attract and hold the capital necessary to permit us to provide the reliable, dependable, low-cost electric service which you, our customers, require.

Included in these explorations, atomic power offers some possibilities. As all of you no doubt know, the Duquesne Light Co., in cooperation with the Atomic Energy Commission, is now designing and building a power plant with a capacity of at least 60,000 kw, to be completed in 1957, which will use atomic energy as a source of heat. The Westinghouse Electric Corp., under contract with AEC, will build the nuclear reactor. This will be the first full-scale atomic power plant in the nation. Essentially this plant will be the same as a conventional power plant except that an atomic furnace is substituted for the boiler. Instead of a boiler producing steam by burning coal, the atomic furnace will produce steam by means of uranium. The steam turbine, the generator and associated equipment are the same in either plant. The biggest stumbling block at the moment is the fact that it now costs very much more to build an atomic furnace than the conventional boiler presently used.

Other very difficult problems, far too numerous to mention, also remain to be solved.

Uranium and Coal

However, one pound of uranium, only about one cubic inch in size, contains as much heat as 1500 tons of coal. That amount of coal costs over $7000. The cost of uranium, according to one authority, is "more like $20.00 a pound." On that basis our coal costs are over 300 times as much as uranium.

Nevertheless, this difference in cost is what provides the tremendous incentive to try to overcome the many exceedingly difficult problems involved in producing atomic power. How soon and to what extent we can overcome these obstacles no one can say at this time—that can only be determined by actually building and operating some full-scale atomic power plants. This will take a lot of money, a lot of manpower and, above all, a lot of team work.

A Word of Caution

As a word of caution, before trying to draw any definite conclusions from this statement, I would like to say parenthetically that there are many elements which make up the final cost of electric service, fuel being only one. The average cost of fuel alone in our company service is approximately 3 mills per kilowatthour. If and when this cost is modified downward, all of the other elements in cost determination, based on present knowledge, would remain the same, plus whatever increased investment, if any, there might be in the atomic boiler.

Electricity's Dependability and Low Cost Factors Behind Industry Growth

The dependability of electric service and its low cost have been the major factors behind the tremendous growth of the electric industry. In 1939 the privately owned utility companies in the United States received an average price per kilowatthour of 1.69 cents from its commercial and industrial customers. In spite of the fact that the inflationary spiral started about this time, this average price per kilowatthour continued to decline until 1943 when the average price reached a low point of 1.32 cents per kilowatthour. Technological improvements in the past have helped to keep our costs down, but inflation has a way of catching up with everyone, and it caught up with us in 1943 because while in that year, as I have just mentioned, the average price per kilowatthour received from these commercial and industrial customers was 1.32 cents it rose to 1.52 cents ten years later in 1953. The inflation is still having a material effect on us and, while I am sure the future still holds promise for low-cost electricity, it appears as though the downward trend of prices in the past has been stopped. Just as the trend has been slightly upward in the last ten years, we may have a continuation of this upward trend in the future. But I emphasize again that it is and still will be a low-cost product. It is still a small portion of the cost of finished steel. For example, compare the average price received for the commercial and industrial service in 1943 with the figure which I quoted for 1953, and it shows only a 15 per cent increase, whereas in this same period the price of most commodities has more than doubled. (Figures from FPC Report for 1953.)

One thing that should be borne in mind when thinking of the price paid for our electric service is that all of the supplies, materials, equipment and labor which we use in producing that service is purchased from the same

(*Continued on page* 14)

Coal and Kilowatts

By A. C. Monteith
Vice President in Charge of Engineering and Research,
Westinghouse Electric Corporation

An address before the National Coal Association, November 18, 1954

EVEN though the organization I represent is close to the problems that beset both the coal and the electric utility industries, we are, nevertheless, in a unique position to consider them in a completely objective way. It is from a position of objectivity that I would like to review with you the future of coal in the electric utility industry.

There has been a tremendous amount of conversation and writing about atomic power and its eventual displacement of other sources of energy. It is inevitable that the atom will become important in our way of life. When, some years from now, more conventional sources of energy begin to disappear, atomic power will be indispensable to our welfare and defense. This day of need for atomic power may not be so far away as might first be suspected, depending on the time scale used. Therefore, at Westinghouse we are striving diligently to develop economic, efficient atomic power generating plants.

Reasons for Continued Research

At the same time, we believe that the coming of practical atomic power will be evolutionary, not revolutionary. That is why we are, concurrent with our atomic power program, continuing to spend millions of dollars and millions of manhours in heat cycle research and in development of better and more efficient power-generating equipment for coal-burning plants. Coal today is more essential than ever in helping to provide the nation's need for electric power. It will be even more necessary in the years ahead.

Let it be established then that coal is basic to the continued growth of the electric utility industry. But what is the outlook for future growth of the electric utility industry? Just what kind of market for coal will this growth bring with it?

For the past 50 years the electric utility industry has doubled its production of energy every decade. In 1954 the industry reached 100 million kw of generating capacity. And there is no end in sight! The historical rate of increase is expected to continue. I feel reasonably certain that there will be about 400 million kw of installed capacity in 1975 and if the traditional rate of doubling every ten years continues, there will be from 1.5 to 1.8 billion kw by the time the year 2000 appears. Many of us may say we do not have to worry about the year 2000. But there will be a coal industry and electric power industry at that time and there will be stockholders to be satisfied.

There are some real opportunities for coal in such a growth picture. Right today the electric utilities constitute the coal industry's largest single customer—taking better than 22 per cent of output. The years to come will find an even larger percentage of your production going to produce electric power.

Today, 50 per cent of all power generated by electric utilities is generated with coal. Other fuels and water are the additional energy sources.

We know that there are large reserves of coal and that it will be economically feasible to market them for some years to come. This is not true of all other energy sources. With them there is the problem of waning supply which, naturally, brings with it increased cost. The combination of the two, short supply and high cost, cannot help but make way for greater use of coal.

Water Power a Minor Competitor

Water power will continue to be a factor but will be a minor competitor in the field of energy sources for the electric utility industry. Most of the desirable sites in the United States have already been developed. For example, TVA was originally constituted as a hydro-authority, but now has approximately half of its capacity in steam plants. This is indicative of the problems water-wheel generation faces.

While painting this optimistic picture about coal, we cannot forget that there are going to be some developments that will make it possible to extract the heat energy from coal more efficiently.

The first electric utility turbine generator used some seven pounds of coal to produce a single kilowatthour of electrical energy. Today, the industry average is one pound of coal per kilowatthour, and in a modern station it is down to about three-quarters of a pound. It will be only two-thirds of a pound per killowatthour when machines such as the 275,000-kw machine Westinghouse is building for Philadelphia Electric are installed.

The Future Coal Market

Now this is phenomenal progress. In years to come, when similar progress is balanced against utility growth and the aforementioned factors of depletion and increased cost of other energy sources, there will still be a big market for coal. As a matter of fact, the electric utility market for coal will increase at a slightly slower rate than the rate of electric utility growth. You may expect to have to supply to the electric utilities in 1975 at least three times the coal you sold them in 1954.

When we consider energy sources available to electric utilities in the near future, atomic power is not a significant factor. Again looking in the crystal ball, it is estimated that in 1963 less than 2 per cent of the power generated will be accounted for by the atom.

But let's do a little dreaming about the atom. Let's look ahead to the year 2000 and see what may have happened to coal.

Various authorities have estimated varying amounts up to 50 per cent of all electric power generation will be

accomplished with atomic power. Strange as it may seem, this should not be alarming to the coal industry. Between the present time and the year 2000, the electric utility industry will have continued to grow at a tremendous rate. Again, there will be some developments along the line of efficiency of coal-burning plants and some other sources of energy still in the picture. But by the year 2000, the coal industry must be able to produce six to eight times more coal for the electric utility industry than today if it is to meet its responsibilities. This is approximately twice as much as the total coal mined today for *all* purposes. This, gentlemen, suggests a significant growth potential for the coal industry. It constitutes a tremendous opportunity, as well as a serious responsibility. I am sure the coal industry has initiated thinking which will build toward a capacity capable of supplying such an ultimate demand.

Other Growth Areas for Coal

But this is not all. Let me widen the picture for just a moment to mention some other promising growth areas for coal. Already some of your competitors are turning to coal to supplement their products. The natural gas people are eyeing coal as a raw material source for making gas. And the conversion of coal to chemicals is already under way. In fact, the time may come when mankind will look upon the simple burning of coal as too wasteful of its precious by-products. Indeed, the future of coal abounds with opportunity for growth.

But this is not to say that along with these market opportunities there will not be serious problems for the coal industry in realizing this growth. Not the least important among them will be the need to make coal more economical and more attractive to use in the electric power field.

In a coal burning plant, about 50 per cent of the cost of producing a kilowatthour of energy resides in the coal itself. To electric utilities and to equipment manufacturers, this strongly indicates an area for study. It should also point out to the coal industry that research and development of production techniques which lead to a reduction in the price of the product would certainly be in order.

For a moment, let's consider what your industry and mine are doing and can do to continue to make coal even more desirable as a fuel for the electric utility industry.

Two-Fold Challenge

Basically, the challenge is two-fold. It is not only necessary to bring cost down, but to develop more efficient means for using coal.

Opportunities for your research and development lie primarily in the direction of cost and price reduction. The key to this is mechanization and modernization. Electricity —the end product of your key customer, the electric utility—becomes an important factor in modernization and mechanization. We at Westinghouse, who build equipment that can utilize electric power to implement new production techniques, are anxious to work with you. More power, more tools in the hands of each miner is the solution to lower-cost coal at the tipple.

But efforts toward reducing cost do not end here. Transportation costs represent a sizeable consideration in over-all fuel cost to a utility. The coal industry can go a long way in assuring its future by taking an interest in and helping find a solution to this problem.

Coal Handling at Power Stations

Too often, I'm afraid, we assume that problems involved with coal handling at a power station are ones which utilities, alone, have to solve. Actually, your industry and mine are both in a position to help with this one. It's something that has to be considered if coal is to be made a more attractive fuel and a more economical one to use. In your cleaning and preparation plants there is much that can yet be done to better prepare the coal for the boiler. My industry, too, must develop new products to help improve conveyor systems, coal-burning equipment and the like.

Finally, the coal industry has an important responsibility to itself to make its product more acceptable to utilities in terms of considerations other than cost. To the utilities, the matter of public relations is of paramount importance. Therefore, for example, they look to the coal industry to help make that fuel clean burning. Here again, your industry and mine can team up to do the job. Among other things, preparation plants again will have to do a still better job—fly-ash precipitators will have to be included if a community is to consider a coal-burning power plant a "good neighbor."

These, then, are some of the important areas for activity on the part of the coal industry in preserving for itself the electric utility market. We recognize that the electric-equipment manufacturer has a part in these activities. The initiative, however, in these particular endeavors rests with the coal industry.

In making coal more attractive to the electric utility industry there is one area in which the equipment manufacturer should, and is, taking the lead. It is in the realm of more efficiently using coal and improving the heat cycle in the generation of electricity.

Role of Coal in Future

This would seem to be an endeavor that would decrease rather than increase markets for coal. Actually, the situation is this. Anything that can be done to make coal more attractive, more economical as a fuel, protects its future and expands its potential markets. Coal will grow in importance as a source of energy for the electric utility industry only as long as it continues to be the most economical fuel. If such a status can be maintained, other fuels will be ruled out and even the advent of nuclear power can be held off. Nuclear power, like anything else, will ultimately have to earn its place in our competitive system on an economic basis.

This, then, establishes the role of the equipment manufacturer in coal's future as an extremely important one.

The boiler maker, for example, is vitally interested in perpetuating coal as the chief fuel for the electric utility industry. These boiler builders are pouring great effort into new developments in their products. The same can be said for the builders of coal-preparation and handling equipment, and many others.

Westinghouse, too, is betting on the future of coal in the electric

utility industry. Because of this, we are directing much of our research and development into the fields of metallurgy, fluid flow, chemistry and the heat cycle itself. These investigations reflect themselves in the design of turbines, for example, that continue to wring still more horsepower out of every pound of coal. Such research and development has demanded greatly expanded facilities, millions of dollars and endless manhours.

We are working with higher steam pressures and temperatures in an attempt to push thermal efficiencies still higher. The Philadelphia Electric Co., with Combustion Engineering and us, is pioneering in this high-temperature, high-pressure field. The new 275,000-kw Westinghouse turbine to be installed on their system will operate on steam at 5000 psi and 1200 F, the highest temperature and pressure ever projected, and will have a thermal efficiency of better than 40 per cent.

Developments such as this super-pressure turbine stem from things like better materials, improved blade design, superior knowledge concerning lubrication and cooling and of the flow of steam through the turbine itself.

New Research Laboratory Built

Westinghouse has built, or is building, three new facilities to especially study these and other related problems. Our new research laboratory in Pittsburgh is designed to devote increased effort toward accumulating fundamental knowledge of new high-temperature alloys.

At Blairsville, Pa., a new special-alloys development plant will soon go into operation. There, scientists will work to develop metals capable of practical application at these higher temperatures and pressures. Their use will permit even a greater amount of the heat energy from coal to be translated into mechanical force to drive a generator.

Westinghouse is now dedicating a new multi-million dollar laboratory at South Philadelphia. It is devoted entirely to research and development in connection with all phases of steam-turbine design and application. In addition, some basic research is to be done there in connection with the heat cycle itself. Some important contributions to the art of wresting energy from coal have already come from this facility.

These few examples, I'm sure, persuade you that equipment manufacturers are vitally interested in power-generating processes which rely on coal for energy. Westinghouse, as much, or more perhaps, than any other equipment manufacturer, recognizes the important role that coal has to play in our future electrical way of life.

And now a final word on atomic power. Because technical advancement is usually costly, it is often difficult to separate technical and economic progress. The cost of developing atom-powered generating stations is high. This is due, principally, to the fact that development work can be carried only so far on a theoretical or empirical basis. It soon becomes necessary to secure practical experience. This can be obtained only by building and testing and building again. In spite of this, it is absolutely essential that we progress toward more knowledge concerning the atom. In the interests of national defense and economic survival, we must be energetic in our nuclear development programs.

Certain foreign countries, some friendly, some not, faced with lack of fossil fuels and a nearly impossible fuel importation problem, are being forced to move rapidly in the direction of atom-powered generation.

Do not become complacent in the thinking, however, that coal's economic advantage is assured in all places in this country. There are some areas in the United States where coal has had to give economic place to other fuels and to water power. The time may come when these other sources of energy will cease to be able to handle the demands for electric power. It is almost a foregone conclusion that atomic power will be able to compete with coal in these areas if present coal costs persist.

Generally speaking, then, it can be said that atomic power is coming faster technically than it is economically. For that reason we have given some emphasis in this discourse to cost as the key protecting coal's future markets. Coal can continue to be important to the electric utilities only if it is the most economical source of energy, all things considered.

The co-existence of coal and the atom in the field of electric power generation is neither impossible nor undesirable. What the balance between the two will be in the years to come will depend largely upon the economic advantage one may gain over the other.

The bright future for coal can be assured if all concerned take positive action toward lower costs and more efficient utilization of coal's energy. The challenge to the coal industry is clear cut. Some realistic, far-reaching planning will have to be done now if the coal industry is to lay hold of the opportunities the electric utility market offers.

Edward T. Gushée

EDWARD T. GUSHÉE, Vice-President of The Detroit Edison Co., died December 15 after a short illness. He was in charge of the Legal, Rights-of-Way and Public Information Departments of the company.

Born in Los Angeles, Calif., in 1895, he was graduated from the Kent School in Connecticut and attended Pomona College, Claremont, Calif. He was once manager of the Castle Hot Springs Hotel in Arizona.

Mr. Gushée was an infantry captain in the AEF during World War I. He was employed by Detroit Edison in 1920, serving first in the Sales Department and later in the Inspection Division of the Research Department which he organized. Mr. Gushée then became purchasing agent and was elected a vice president of the company in 1935, and a director in 1936. In 1939 he became executive vice president and director of Union Electric Co. of Missouri. Mr. Gushée was called to Washington early in 1942 to serve as Chief of the Purchase Policy Branch, Ordnance Department, U. S. Army. He returned to Detroit Edison as assistant to the president late in 1942; was later assistant to the chairman of the board and was re-elected a vice-president in January, 1948.

Mr. Gushée was president of the Detroit Streets and Traffic Commission and president-elect of the American Standards Association.

Program Announced for Street Tree and Utility Conference to be Held March 3-4

A tentative program has been announced for the Street Tree and Utility Conference to be held March 3-4 at the Wade Park Manor Hotel in Cleveland under the joint sponsorship of the EEI Transmission and Distribution Committee, the IES Street Lighting Committee and the Shade Tree Selection Committee of the National Shade Tree Conference.

The conference will be devoted primarily to long-range plans that will provide for cooperative coexistence of street trees and utility installations to the benefit of municipalities throughout the country. The program includes the following speakers and topics of discussion.

First Session

On Thursday, March 3, J. W. Anderson of Philadelphia Electric Co., who is Chairman of the EEI Transmission and Distribution Committee, will preside as chairman of the conference. After the keynote speech, "Our Streets Can Be Beautiful and Useful," and the theme address, "1954 Hurricanes Pin-Point the Need for Long-Range Coordinated Programs," Charles A. Young, Jr., City Forester of Baltimore, Md., will speak on "Why Street Trees?"; David Baldwin, of the National Safety Council of Chicago, will discuss "Why Street Lighting?"; and G. E. Dean, Public Service Electric and Gas Co., will talk on "Why Overhead Lines?"

Following lunch, W. H. Edham, representing Holophane Co., and H. W. Osborne, representing the City of Buffalo, N. Y., will discuss "Design of Street Lighting — Standards and Permissible Departures." E. V. Sayles, Consumers Power Co., will then speak on "Power Line Design for Compatibility with Trees" after which Forrest Woodland, Plant Structure Engineer for American Telephone & Telegraph Co., will talk on "Coordination of Telephone Lines with Street Trees." The next speaker will be Samuel S. Baxter, Commissioner of the Water Department of Philadelphia, Pa., who will present "Subsurface Problems of Trees and Utility Structures."

A banquet in the evening will be presided over by Kirk M. Reid of General Electric Co., who is Chairman of the IES Street Lighting Committee. Highlighting the banquet will be a discussion of "The Selection and Use of Trees to Minimize Public-Area Conflicts" by Edward H. Scanlon, Consulting Arborist and Editor of the magazine, *Trees*.

"Examples of Coordination"

Mr. Scanlon, who is Chairman of the National Shade Tree Conference Shade Tree Selection Committee, will be presiding officer of the conference on Friday, March 4. The theme of the second day will be "Examples of Coordination" and speakers will be divided into three groups — Street Lighting, Overhead Lines and Street Trees. R. E. Dahlin, Southern California Edison Co.; F. J. Schmitt, Rochester Gas and Electric Corp.; J. W. Young, New England Power Service Co.; and D. A. Toenjes, General Electric Co., will speak on Street Lighting. Representatives of The Connecticut Light & Power Co., The Cleveland Electric Illuminating Co., New Jersey Bell Telephone Co. and Pacific Gas and Electric Co. will talk on Overhead Lines. Speaking on Street Trees will be G. C. Blair, Forestry Consulting Services, Jackson, Mich.; W. I. Myers, Superintendent of Forestry, Detroit, Mich.; J. A. Sweeney, City Forester, Toledo, Ohio; and J. A. Dietrich, Superintendent of Trees, Greenwich, Conn.

All speakers will act as members of a panel in the afternoon and questions from the floor will be discussed. The final speaker of the conference will be Professor H. O. Perkins of the University of Connecticut, whose topic will be "Conference Summary— and the Next Steps."

The registration fee for the conference will be $12.50. The fee includes admission to the Thursday evening banquet and entitles the registrant to a copy of the conference proceedings, in which all papers and discussions will be printed. Extra copies of the proceedings will be available. Registrations and fees should be sent to E. H. Scanlon, 7621 Lewis Rd., Olmsted Falls, Ohio.

I Want to Know About the Electric Industry, 1954-1955 Edition, Now Available

THE 1954-1955 *I Want to Know About the Electric Industry*, the seventh annual edition of the electric industry fact book is now available.

This year's edition discusses in some detail the industry's record growth in recent years, the financial investments which made this growth possible, and future prospects for continued expansion, extending as far ahead as 1975 and including a discussion of the possibilities of a transition from the use of ordinary fuels to nuclear energy in the production of electricity.

The seventh in a series begun in 1948, the booklet is presented in the form of 28 questions frequently asked about the electric industry, ranging in subject from "How Does the U. S. Rank in World Production of Electricity?" and "How Fast Is the U. S. Moving in Production and Capability?" to "How Many Customers?" and "How Much Fuel Is Used in Electricity Production?" The use of electricity in the home, on the farm and in industry and commerce, source and disposal of electric company revenues, steam plant and water power installations and ownership trends of generating installations are also discussed.

Answers to the questions are in text-and-table form, derived from such sources as the EEI's annual *Statistical Bulletin* and various FPC publications, and together they constitute a comprehensive, up-to-date picture of the nation's vital electric industry. To those interested in reading or writing about the industry, previous editions in this series have proved their value as a convenient, concise reference.

Quantity prices of the booklet are:

2 to 99	$ .25 each
100 to 999	$ 9.50 per hundred
1000 to 9999	$76.00 per thousand
10,000 or more	$67.00 per thousand

Motivation of Employees' Behavior

By J. P. Flemming
General Supervisor—Personnel Services,
The Cleveland Electric Illuminating Company

An address before the 1954 EEI Industrial Relations Round Table Conference, Chicago, Ill., September 27, 1954

YOUR boss probably told you just before you started out to this conference, "What I'm interested in is increased production. Get some answers to that problem!"

You'd better look for the answers —because that is the problem facing all of us in the electric utility industry today—and every day. We must find ways to increase production. We must meet and beat our competition. Your company and mine must seek new technical processes and new equipment if they want to stay alive. Just as importantly, each of our companies must utilize to the fullest extent its human resources — its employees.

The Problem

Very frankly, the problem which faces us is this: How can we create and maintain the conditions under which our employees will produce the largest amount of good work, on a sustained basis, at the lowest possible cost?

Time and cost are factors which are frequently overlooked by "human relations" experts.

Take any two businesses that are equal in nearly all respects. One will be more successful than the other. That will be the one with the higher employee motivation, or morale.

What do these words mean? In their everyday sense, according to Doctor Floyd Mann of the University of Michigan, the terms motivation and morale refer to the extent to which people will strive for the attainment of a goal or objective. Motivation is an individual concept; morale is a group concept.

The problem that faces us is to stimulate in our employees a feeling of working together to achieve the company's objectives. We want our employees motivated to think, to plan, to show initiative and to work efficiently.

A common complaint today in industry is that employees are not motivated to do a good day's work.

All over the country companies are trying to reduce waste. It appears that the greatest waste of all is human energy. It is the difference between what employees *can* do — and what they *will* do.

This problem of motivating employees is one that has been growing as business has grown in size. Back in the days of small businesses, it was easy for the "boss" to weld together a tightly knit productive team. All his employees knew where the boss stood, they knew where the company stood, they knew where they stood.

As companies grew, their size and complexity made tremendous demands on the time and energy of the boss— personal leadership became difficult, if not impossible.

Many employees lost their zest for work. There was a lack of job satisfaction and loss of pride in accomplishment. They felt the boss was no longer concerned with their welfare. They felt they were part of a "lonely crowd" — just one of 1000 or 5000 faceless employees.

Most of us want a job which gives us a chance to use the abilities and skills which we have. The old-fashioned laborer, who got satisfaction out of shoveling a pile of coal into a furnace, now gets little satisfaction out of pushing a button to start an automatic stoker. In the old days he could see the pile of coal when he started. He felt good about making the pile disappear. Today he goes home at the end of a day unsatisfied. He then becomes a willing listener to radio and TV propaganda — "down with the bosses."

Employees, being human, want to excel in what they are doing. We all want to win at golf or tennis or bridge. Charles Wilson, Secretary of Defense, said recently, "Nine out of ten people want to do the right thing. They want to feel they are doing something valuable, doing it well, and not having their time wasted."

As a utility man pointed out the other day, "Some of our toughest eggs, union-wise or whichever-wise, will work themselves dizzy during real trouble—they won't get back into what has seemed to be their character until things are cleaned up and back to normal. Then they begin to grouse about the meal time every four hours the union contract says they should have, but which they don't even think about during the trouble."

Must Be a Way to Motivate

Certainly no one would suggest that the answer to motivating people is a continuous state of emergency. But there must be some way of providing motivation.

What motivates employees? Much research on this subject has been done in industry by some outstanding people.

Doctor Morris Viteles of the University of Pennsylvania, who is well known to us in the electric utility industry because of his work with Philadelphia Electric Co. and with the EEI Industrial Relations Committee, has compiled a most comprehensive account of the latest studies and surveys bearing upon the wants and needs of workers. I recommend to you as a reference handbook his work, *Motivation and Morale in Industry.*

The people at the Survey Research Center of the University of Michigan have done outstanding employee motivation research in industry. This organization, which has conducted research projects at Detroit Edison, is mentioned prominently in the magazine, *Business Week,* in its three-part special report on "Motivations." I recommend that you place these articles on your reading "must" list. They appeared in the August 14, 21, 28, 1954, issues.

The editors of *Business Week* state that this report was prompted by

their recognition of the fact "that business will look more and more to the behavior scientists for help in their problems." The editors feel that "the value of motivation research stems from the fact that it aims at discovering what people want."

Opinion Research Corp. of Princeton, N. J., has conducted many surveys of employee motivation. Central Surveys, well known in our industry, has conducted excellent surveys. There are others, too numerous to mention, who have done research in this field.

In browsing through the volumes of material on what motivates employees, I have come up with a laundry list of factors. Let's examine them.

This list which we will review is not necessarily in any order—order of importance or alphabetical order. Neither is it all-inclusive. The time I am allowed would not permit a complete listing, even if I were sure I knew all the factors.

Here are some factors:

Job Satisfaction

Most people want a job which gives them a real chance to use their abilities and skills. There is a good feeling that comes at the end of a successful day on which a job has been well done—a day that has not been wasted or spent on some dull task.

Fair Treatment

People want to work for a company that shows, not only by words, but by deeds, that it believes in fair treatment for employees—fair and equitable wage plans—a fair system of promotion—fair discipline—no favoritism.

Good Pay

Everybody, no matter what the size of his pay check is, wants more money. The pay check, according to many, is the biggest single incentive so far discovered.

The fact that pay is a potent force in motivating people should not blind management to the fact that opinion surveys reveal that beyond a certain stage the promise of higher pay for higher efforts seems to bring diminishing returns.

Pay, therefore, is not the only factor. Even when an employee, in an opinion survey, expresses satisfaction with his pay, he usually expresses a desire for some other form of satisfaction. It is important that a company, if it wishes to motivate its employees, should make certain that its wages are fair and equitable.

Recognition

"How am I doing?" That's a question in the back of every person's mind. We all like to know how we stand in the eyes of our "boss."

Every employee longs for a measure of recognition from his supervisor, either for the quality or the quantity of his work, or for some special skill or ability he may possess.

There are many areas where recognition can be given. Does an employee have a good attendance record? Does he get to the job on time? Does he do a full day's work? Has he a good safety record? Does he get along well with his fellow employees? Has he made a good work simplification suggestion? If he does these things, he'd like to be told about it.

Participation in Decisions

Employees like to "get in the act." They like a chance to contribute their suggestions and views. Many employees would like to have more opportunities for decision making in their job.

As proof of this, a recent morale survey in a company revealed that 90 per cent of the employees with high morale felt that discussions with their supervisor about their jobs were helpful.

Incidentally, I would like to bear witness to the fact that employee participation in decision making works. I have seen instances where, when an employee group has a part in planning a job, the people in the group take great pride in doing the job, not only well, but on time. After all, it was their plan!

Floyd Mann of the Michigan Institute for Social Research has determined from his studies that supervisors who create an atmosphere which makes for fair and easy discussion of problems have fewer absences in their work groups than those who do not. This participation factor seems to be a powerful motivating influence.

Opportunity

Employees want the opportunity to use their full abilities and an equal, impartial chance with others to advance into a higher job. They want the opportunity to grow with a growing company.

For example, here is a statement made by an employee who participated in a recent opinion survey: "My future depends on the future of my progressive company. There are jobs for those who want to get ahead. There's proof that they promote from within."

Pride in Company

An employee wants to have a feeling of pride in the company for which he works. He wants to be proud to be associated with the people who represent the company.

The employee also wants to be proud of his boss. Good employee morale and motivation develop and thrive when there is respect for and confidence in the management of the company. He wants to be a part of a group that is "better than most." Work groups with high group loyalty show more team work and more willingness to help each other.

Here, then, are some of the factors that motivate employees to do a good job.

A company, in order to utilize its human resources to the fullest extent, must have proper top-management conviction about the measures promoting high morale—and must give proper attention to these measures. Company policies, practices and procedures must be designed to put these measures into effect. This will go far toward creating respect for and confidence in management.

Supervisor and Group Morale

However, the best of company policies and authorized practices will be of little benefit to the morale and effectiveness of an employee group, if the group has a supervisor who is the "don't know" or "don't care" type.

Management, to any group of employees, is most generally known in terms of the immediate supervisor. This was pointed out by J. Ward Keener, Vice President of B. F. Goodrich, in a recent speech. He said:

> "The immediate supervisor is his employees' main management contact, their principal guarantor of management interest and action, the one to whom they must go with problems and complaints, the one who must act for them with higher

management levels when the situation so requires, and the one in management from whom they must acquire the intangible, emotional values that make them feel like important individual human beings, instead of cogs in a machine. Each supervisor is, for his people, the one person most responsible for their attitudes toward the management group as a whole."

Morris Viteles, in his book, *Motivation and Morale in Industry*, writes:

"Both experimental studies and employee-attitude surveys provide convincing evidence that the quality of supervision is a major factor in stimulating production, influencing attitudes, and in satisfying the needs of workers. The statement, by one worker, that 'Morale is the treatment I get from the boss' summarizes a not uncommon employee attitude toward supervision.

"Recognition of this situation by management is apparently found in oft-repeated assertions that the supervisor or foreman is the 'key man' in industry, the 'cutting edge' of management, or management's 'right-hand man.'"

According to these findings, the solution of the problem is to give the first-line supervisor the status, the recognition and the skills and techniques he needs to do this motivation job.

Status and Recognition

How is this to be done? First of all, the first-line supervisor must be given status and recognition.

Again quoting Doctor Viteles' book:

"To give the foreman status and recognition involves, first of all, a clear formulation of the boundaries of his job. It calls for specific delegation of authority commensurate with responsibilities. The foreman deserves a place to work and physical appurtenances appropriate to the prestige which he should enjoy. The foreman must not be placed in the position of obtaining information on policy changes or current information only at second hand, perhaps even from the union steward or the union's business agent. He rightfully has a place in the policy-making mechanism, as it operates with respect to both equipment and personnel. The foreman wants to be seen, recognized by, and occasionally meet with his supervisors. In short, he wants top management to accept and treat him as though he were truly part of management."

Let's examine that quotation for a minute.

The foreman must have a clear formulation of the boundaries of his job. That means that he must know his place on the company's organization chart—to whom he reports. He can have only one boss.

The foreman must have a description of his job, setting forth in detail his duties and his responsibilities. He must be delegated the authority to go along with his responsibilities. He must be told by his boss how he's doing. He wants recognition for his work. He wants his boss to know he's around.

Next, the first-line supervisor must have the skills to do his job.

Robert Katz of the Amos Tuck School of Business Administration at Dartmouth College has just written an article on his research into what makes a good supervisor. He says that successful supervision appears to rest upon several basic skills. He calls them technical skill and human skill.

Technical Skill

Technical skill he defines as "an understanding of, and proficiency in, a specific kind of activity—one involving methods, processes, procedures or techniques."

Human Skill

Human skill is defined as the supervisor's ability to work effectively as a group member and to build cooperative effort within the team he leads.

As technical skill is primarily concerned with working with things, so human skill is concerned with working with people. The supervisor with highly-developed human skill has studied his own attitudes and beliefs about other people and other groups and is able to see the usefulness or limitations of his own feelings toward others.

By accepting the idea that his own attitudes may be different from the attitudes of others, he is skillful in understanding what other people really mean by their words and their behavior. He is skillful in communicating to others, in words they can readily understand, the reasons he acts and thinks as he does. He works to create an atmosphere in which his employees can express themselves freely without fear of ridicule or censure. He encourages them to participate in the planning and carrying out of those aspects of the job which directly affect them.

Professor Katz points out in his article that human skill cannot be a "sometime thing." It cannot be put on or removed like an overcoat. Everything a supervisor says or does (or leaves unsaid or undone) has an effect on his associates. His true self will, in time, show through.

Thus, human skill must be naturally and consistently demonstrated in the supervisor's every action. It must become an integral part of him.

Katz, in my opinion, has done an excellent job in identifying these technical and human skills. He makes one other point—he says that the relative importance of these skills seems to vary with the level of responsibility.

How these skills can be developed in the supervisors in your company is your problem. I'm sure some answers to your problem will be obtained in your group discussions.

We've talked about giving the supervisor status and recognition. We've outlined the skills a supervisor needs to successfully do his job of motivating employees.

Supervisory Techniques

Finally, what techniques should a supervisor know how to use in order to accomplish results?

He should know how to:

Lead People

Train People

Counsel People

Communicate

Study Individuals

Utilize Best Efforts of People

Be Loyal
—to Company
—to Employees

Hold Group Meetings

Recognize Real Work

I am sure there are other techniques not listed. This "How To" list should develop good discussions in your group meetings.

To sum up—the research conducted in the field of motivation suggests that employees will develop more productive effort when your company and mine applies an understanding of the basic factors motivating an employee. The relationships between motivations and satisfactions suggest that a high level of productivity can in itself be a source of satisfaction to employees.

Fruits of Research

Research has supplied the knowledge of the needs and wants of employees. Research has also determined the fact that the first-line supervisor is the one who can best motivate employees.

It's up to your company and mine to arrive at a balanced and effective program to motivate employees to produce maximum results.

Power and Steel

(*Continued from page 6*)

market in which you, our customers, operate.

We believe that steel and power are two important factors contributing to the strength of this nation. We believe that electricity will play an ever-expanding industrial role in the years ahead. It will help to produce better products at lower cost, create new products and open brand new markets for producers. We believe that more complete electrification will further strengthen our nation. And you gentlemen who are interested in producing steel electrically must share this same belief.

I would like to close with this note. This nation of ours, made up of free people, living and working in harmony under a free-enterprise system, has become the envy of the world—despite the forces at work attempting to destroy it. I think that continued expansion of the steel industry and the power industry under the free-enterprise system will be important factors contributing to an even greater future strength than we have enjoyed in the past.

Last Call for Entries—

Deadline dates for entries in the seven EEI commercial prize award contests for 1954 are:

February 1 and February 15, 1955

THOMAS W. MARTIN AWARD

Offered to company contributing most to rural electrification and agricultural advancement in area served.

An Engraved Bronze Plaque Naming the Winning Company.

Deadline: February 15, 1955

GEORGE A. HUGHES AWARDS

Offered for outstanding achievement in the field of electric appliance sales and promotion.

Six Trophies and Cash Prizes Totaling $1200.00

Deadline: February 1, 1955

LAURA McCALL AWARDS

Offered in recognition of outstanding achievement and originality in the field of home service.

Five Bronze Plaques and Cash Prizes Totaling $1000.00.

Deadline: February 1, 1955

PLANNED LIGHTING AWARDS

Offered to companies which have most effectively raised the standard of lighting in their communities.

Six Bronze Plaques and Cash Prizes Totaling $900.00

Deadline: February 15, 1955

FRANK WATTS AWARDS

Offered to companies most successful in stimulating promotion and sale of electrically operated farm equipment.

Three Bronze Plaques and Cash Prizes Totaling $700.00.

Deadline: February 15, 1955

GEORGE WESTINGHOUSE AWARDS

Offered in recognition of outstanding performance in the promotion of electric laundry equipment.

A Trophy, a Bronze Plaque and Prizes Totaling $450.00.

Deadline: February 1, 1955

MORE POWER TO AMERICA AWARDS

Offered to recognize achievement in increasing American industrial productivity through industrial electrification.

Two Bronze Plaques and Cash Prizes Totaling $500.00.

Deadline: February 1, 1955

A reminder to electric company chief executives:

February 1, 1955, is the deadline for recommendations for the

CLAUDE L. MATTHEWS VALOR AWARDS

Offered to honor acts wherein extraordinary courage was exercised to maintain or restore electric service.

Bronze Medals and $150.00 Awards to Winning Individuals or Groups.

Complete details may be obtained by writing to:

EDISON ELECTRIC INSTITUTE
420 Lexington Avenue New York 17, N. Y.

Four Connecticut Utilities Jointly Plan for the Future

By Calvin T. Hughes
Vice President, The Connecticut Light & Power Company

An abstract of a paper presented before a meeting of the EEI Electrical Equipment Committee, Hartford, Conn. October 12, 1954

THE system-planning experience described in this paper differs from the usual planning report in that the planning was carried out by the personnel of four electric utility companies located here in Connecticut. These companies are each a separate, corporate entity. The companies mutually agreed in the fall of 1952 to make a joint study of the future requirements of the state, to include generating and transmission facilities necessary to serve the electric loads of the state on a state-wide basis. This to be done for the fewest dollars consistent with good service standards. The responsibility for making the study was lodged with a committee consisting of a representative from each of the four companies. This committee was free to draw upon the personnel of any and all of the companies in working up specific details of the over-all program.

The Four Companies

The companies who joined in this study and their respective representatives are: The Connecticut Power Co. —Fred D. Knight, Vice President, later succeeded by Dwight Douglass, Vice President; The Hartford Electric Light Co.—Charles L. Derrick, Vice President; The United Illuminating Co.—Russell G. Warner, Vice President; The Connecticut Light & Power Co.—Calvin T. Hughes, Vice President, who served as chairman of the committee.

In order to understand the significance of this experience in system planning I believe it would be helpful if the scene is set by giving a few facts about the companies involved and the state as a whole.

In the fall of 1952 the electric load of the state reached approximately one million kilowatts. This was roughly divided one-fourth to The Hartford Electric Light - Connecticut Power group, one-fourth to The United Illuminating Co. and one-half to The Connecticut Light & Power Co. With individual company loads of these magnitudes it can readily be seen that the individual company could not avail itself of the advantages in thermal efficiency, and lesser manpower per kilowatt that are inherent in installing moderately large units such as 100,000 kw. Such a unit would be approximately 40 per cent of the smaller company's load whereas it is only 10 per cent of the state load. Connecticut ranks No. 3 for size in the country. It has a little less than 5,000 square miles and a little more than two million people.

Rugged Individualism

Since the time of George III and the Charter Oak episode, not only the citizens, but corporations as well, have nurtured and cultivated an independence of spirit and rugged individualism not surpassed in America. Those of you who have not had your ears pinned back in a Connecticut town meeting have missed a rugged experience. This quality of rugged individualism for which New England is noted has long been evident in the development of the area's electricity supply. It still exists, but of recent years has been tempered by the realization that the growth in load and development of the art demands an approach to the problem that goes beyond the franchise area of any individual company. In the early days the available size of generating units was small and the pattern was for each town or community to have its own power plant. As the size of units increased, the resulting economies encouraged the trend toward supplying more and more communities from a common source. In some instances the franchise areas of the supplying companies also increased until today there are only a few well-established companies supplying the entire area. The continuing growth in load offers further possible economies which makes it desirable from an engineering standpoint to ignore corporate limits as much as possible.

It is likely that if this paper serves a useful purpose it will be that of recording the experience of a group of engineers working very closely together over a period of about 18 months to solve a common problem. The challenge to the group was to come up with a plan or plans that would meet not only the requirements of the state as a whole but those of each individual company and would provide generating and transmission facilities adequate for the expected needs for the fewest dollars consistent with a high standard of service. This irrespective of franchise territory lines.

Although the study began in 1952 it did not concern itself with capacity additions already scheduled and committed, such as the 40-mw unit at the English Station of The United Illuminating Co. in operation in 1953, the 75-mw unit at the Montville Station of The Connecticut Light & Power Co. in operation in 1954, the 66-mw unit at the new Middletown Station of The Hartford Electric Light Co. in operation in 1954, the Shepaug Hydro Development of The Connecticut Light & Power Co. to have approximately 42-mw in operation in 1955, and the 100-mw unit at the Devon No. 2 Station in operation in 1956. The study did not concern itself with the distribution systems of the four companies or with the purely internal transmission facilities. The study did cover major transmission lines, substations at bulk delivery points, interconnecting lines and generating plants.

Development Programs

The usual procedure of a typical company organization working up a program for future development consists of load forecasting, scheduling additional generating capacity, plotting transmission lines and coordinating these with the existing facilities.

If by chance it seemed advantageous to establish a tie with a neighboring company, all well and good; if not, no further consideration is given to the neighboring company. I find it rather difficult to express in words the atmosphere that prevailed in our committee. It was not one of meek submission to majority opinion, neither was it a subtle insistence that one of the companies be given an advantage. Rather it was a fixed demand, for example, that a unit be installed or a line built in such a way and at such a time that the interests of all, both economic and engineering, would best be served, always having in mind that if the physical facilities were planned to do the best job, the paper work could be adjusted to meet the condition.

The committee, in tackling its problem, divided the work along the general lines of (1) load forecasting, (2) power production and (3) transmission and substations.

Load Forecasts

All groups having the responsibility for system planning sooner or later require that a load forecast be made. Most recognize that load forecasting is not an exact science. In our case we made use of such information as that provided by the Edison Electric Institute, McGraw-Hill Publishing Co.'s Research Department, the Federal Power Commission, the National Industrial Conference Board and private analysts. We found that the estimates of these experts ranged from 2.5 per cent to 9.16 per cent annual rate of growth. Our own experience here in Connecticut for the past 20 years shows that the load for the state has grown at an average rate of 6.25 per cent per year. We concluded that 5 per cent annual growth was a reasonable forecast. This resulted in a state load of approximately 3,000,000 kilowatts in 1975. Simultaneously with this conclusion, however, we agreed that in our studies, aside from the first three or four years, being the period required to install capacity, we would attach no significance to the precise time the load would reach a certain magnitude, rather that loads of 150, 200 and 300 per cent of the 1952 load or 1500 mw, 2000 mw and 3000 mw would be used as load levels on which to base our studies. Short-range forecasts of necessity must be of a higher degree of accuracy than long-range. The former is the controlling element in governing the planned in-operation date of new equipment. The long-range plan is primarily useful in the acquisition of potential generating sites and transmission rights of way and to make sure money spent for major facilities is not wasted.

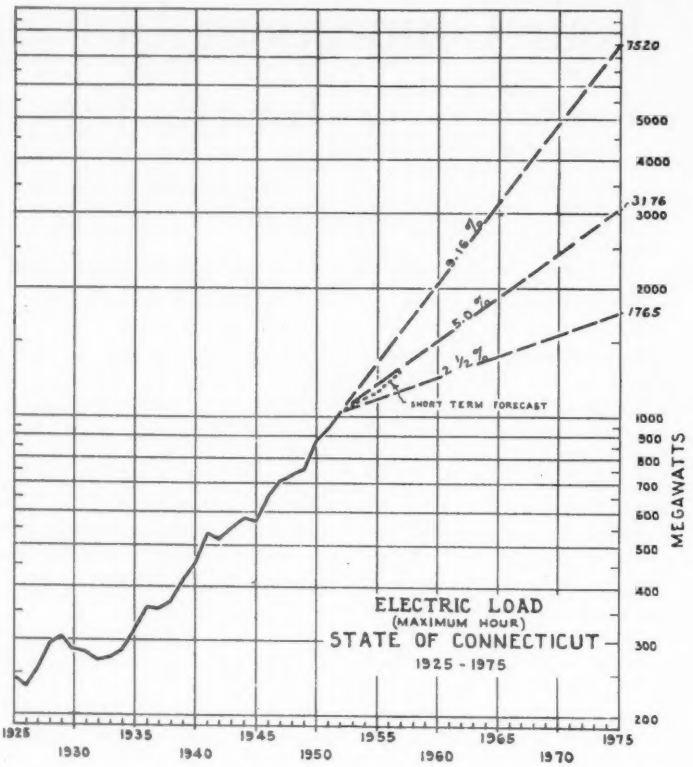

Figure 1

Fig. 1 is a curve showing the annual electric peak loads for the State of Connecticut — actual for 1925 to 1952 and estimated for 1952 to 1975.

We felt, in addition to the above referred to load curve, that a map similar to Fig. 2 was very useful whereon is plotted the loads throughout the state by the use of solid circles, proportional in size to the local load. This type of information is further broken down in Fig. 3, showing the load distribution by towns. Values are for the 300 per cent increase in load mentioned above.

Power Production

In developing plans for additional generating facilities, use was made of the above-mentioned decision to consider only the 150, 200 and 300 per cent load levels. It was recognized that as time progresses it will be necessary to give further consideration to these relatively large steps in growth. Several basic assumptions were made early in the study, as follows: a 15 per cent reserve at time of peak load or coverage for the loss of the largest unit, whichever might be greater; a system load factor of 50 per cent; fixed charges to be at 16 per cent for steam and 14 per cent for hydro development; basic fuel to be coal at 37 cents per million Btu for tidewater plants and 38.5 cents per million Btu for inland plants; dust collector equipment to be installed of approximately 97 per cent correction efficiency.

Although there is available in the state a limited amount of undeveloped hydroelectric generating capacity, it is not of sufficient magnitude to influence over-all results in any way and therefore was not included in the study.

The estimated installed costs of steam-electric generating units were arrived at after discussions with the engineering consultants of all the companies and a review of recent cost data available to the committee. Table I shows such estimated unit costs. It does not, however, include the original site-development costs, such as those for service facilities, coal handling, dredging, administration facilities or

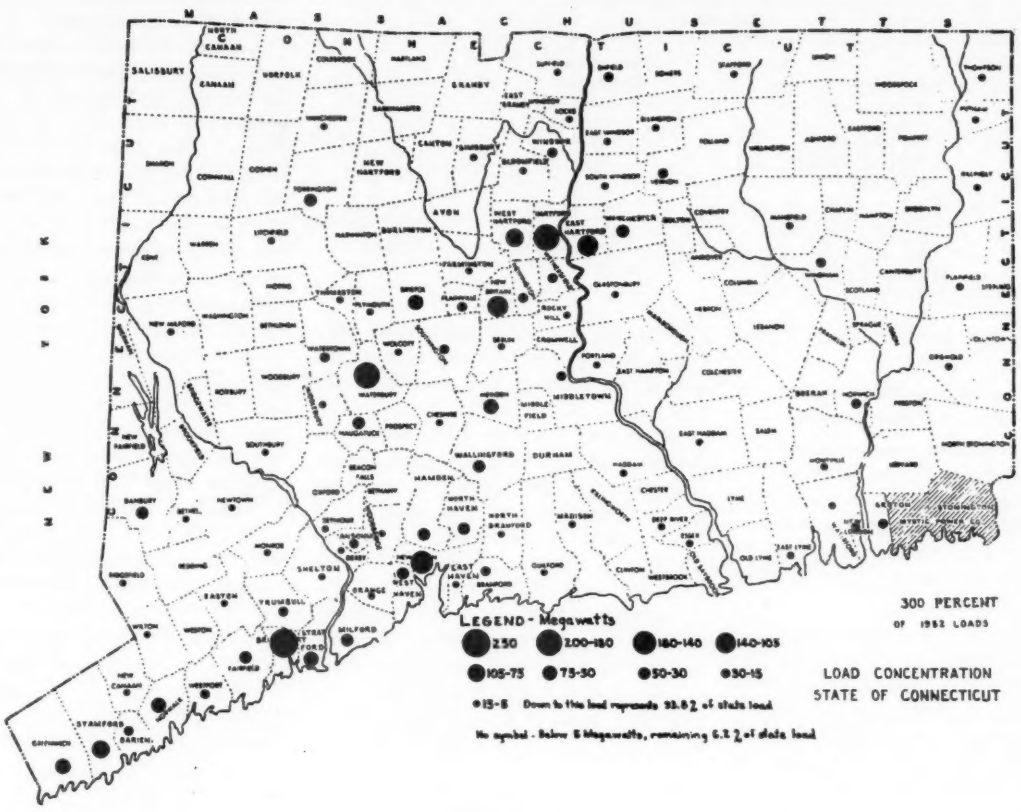

Figure 2

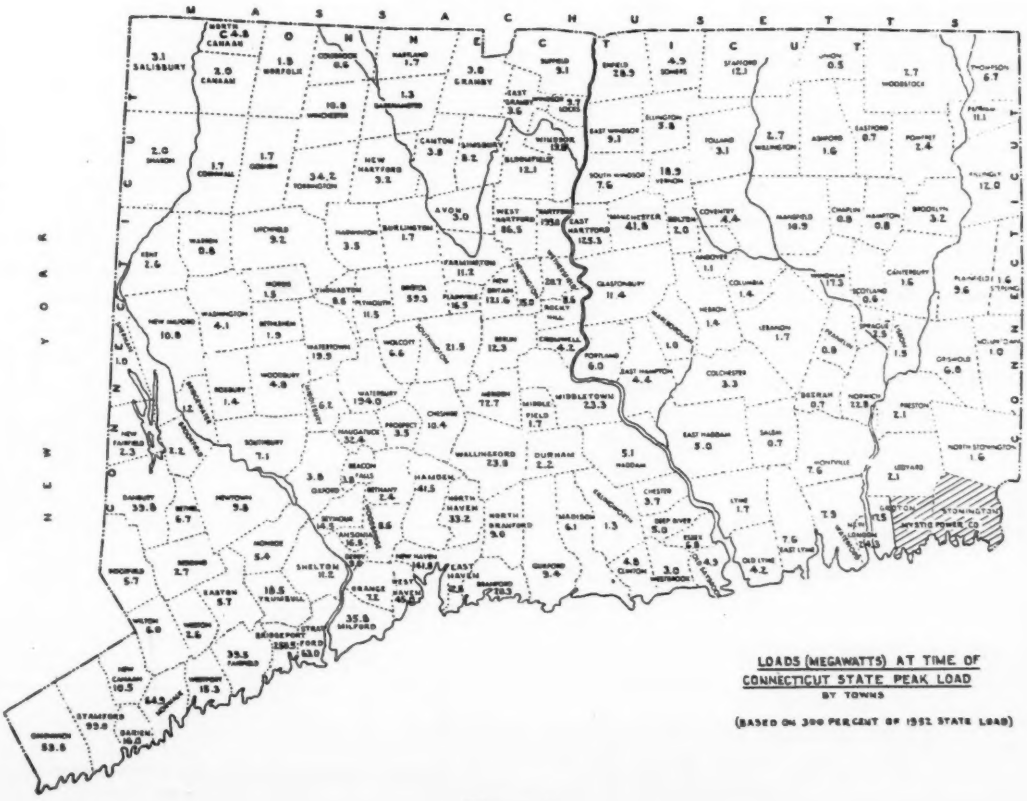

Figure 3

TABLE I—UNIT INSTALLED COSTS
(Estimated)

Unit Size	Steam Conditions	Dollars per Kilowatt—Net Capability	Net Capability (Kilowatts)
40/44,000	850 psig–950 F	$198	44,000
60/66,000	1250 psig–950 F	186	66,000
90/99,000	1450 psig–1000 F	170	100,000
75,000	1450 psig–1000/1000	187	75,000
100,000	1800 psig–1000/1000	180	100,000
125,000	1800 psig–1000/1000	173	125,000
150,000	1800 psig–1000/1000	167	150,000

other costs that are peculiar to a particular site.

The estimated heat rates in Btu per kilowatthour are shown in Table II.

The plant manpower requirements for a single-unit 75-mw plant are 48 men whereas only 50 men are required to operate a 100-mw single-unit plant. On a comparable basis, only 81 and 85 men respectively are required to man a two-unit plant.

Figs. 4, 5 and 6 are graphs showing relative manpower and cost data for different size and number of units in a plant: Fig. 4 shows the number of men required to man plants with one to six units and with two sizes of units; Fig. 5 shows comparative labor cost for plants with from one to six units and with two sizes of units; Fig. 6 shows comparative station expenses on the same basis as the other charts.

A review of the data, together with the great mass of additional information, led to the following conclusions:

1. Normally, units of 100,000-kw capability or larger would be installed after giving due weight to first cost, thermal efficiency, combined system load of 1,000,000 kw or larger and the cost of manning.

2. The initial installation at a new site should be delayed as long as possible consistent with service requirements, thus postponing the two to five million dollar site-development cost together with the high-salary cost required to provide top personnel in the plant.

With this factual material as a background, several alternate schemes of generating and transmission development were analyzed and studied.

The final recommendation as to whether or not a particular site would be used was determined after the Transmission Committee had projected the necessary transmission facilities for getting the energy from the generating plants to the load areas.

Table III shows the proposed cumulative additions to capacity at the several generating sites for the different values of load increases.

It might be well to mention at this time that it is expected the exact schedule of the installation of individual generating units will be varied from time to time. This in no way detracts from the usefulness or effectiveness of the plan and neither will it materially affect the over-all economies. If, for example, on further consideration it proves advantageous to install additional capacity at Bridgeport at or below the 150 per cent load level, which is not contemplated in Table III, and defer the installation at one of the locations shown in the table, it will make no material difference provided two or more of the companies do not schedule additional generating capacity before it is needed on a statewide basis. Should the passage of time prove that the plans made were not carried through to completion it is our opinion that the experience was well worth the effort and expense. The committee, in setting up an ideal objective, as illustrated by Table III, recognized that common sense and the hard facts of life may make it impossible to attain

TABLE III—PROPOSED ADDITIONS TO CAPACITY

Station	100–150 Per Cent Load (Kilowatts)	100–200 Per Cent Load (Kilowatts)	100–300 Per Cent Load (Kilowatts)
Manresa	.....	200,000	300,000
Devon	200,000	200,000	200,000
Middletown	266,000	566,000	566,000
Montville	75,000	75,000	150,000
Hydro	100,000	100,000	100,000
Bridgeport	.....	100,000	200,000
South Meadow	.....	.....	400,000
Branford	.....	.....	500,000
Total	641,000	1,241,000	2,416,000

TABLE II—HEAT RATES
(Estimated)

Unit Size	Steam Conditions	Btu per Net Kilowatthour
40/44,000	850 psig–950 F	11,500
60/66,000	1250 psig–950 F	10,800
90/99,000	1450 psig–1000 F	10,300
75,000	1450 psig–1000/1000	9,820
100,000	1800 psig–1000/1000	9,600
125,000	1800 psig–1000/1000	9,450
150,000	1800 psig–1000/1000	9,300

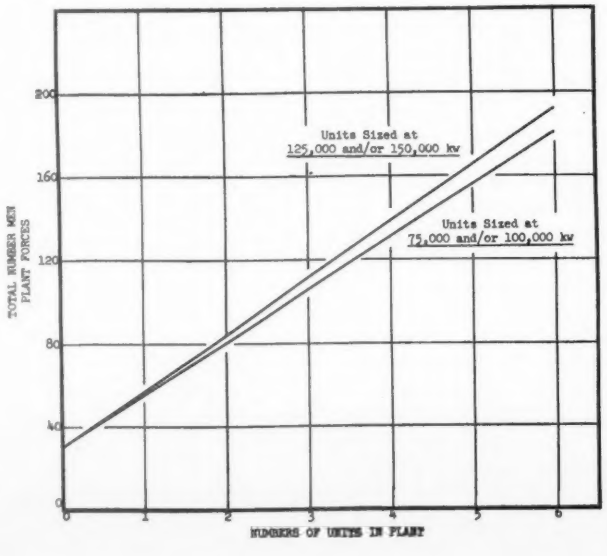

Figure 4 (right)—Comparative Manning Chart. Units Sized at Net Capability.

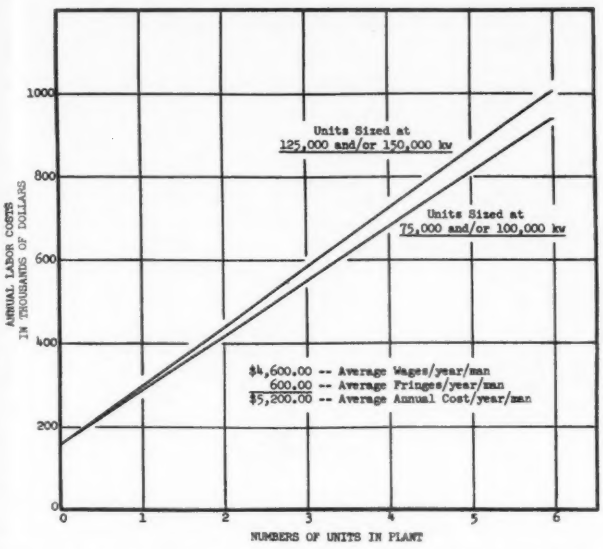
ANNUAL LABOR COSTS IN THOUSANDS OF DOLLARS
NUMBERS OF UNITS IN PLANT
Units Sized at 125,000 and/or 150,000 kw
Units Sized at 75,000 and/or 100,000 kw
$4,600.00 -- Average Wages/year/man
600.00 -- Average Fringes/year/man
$5,200.00 -- Average Annual Cost/year/man

Figure 5—Comparative Labor Costs. Units Sized at Net Capability.

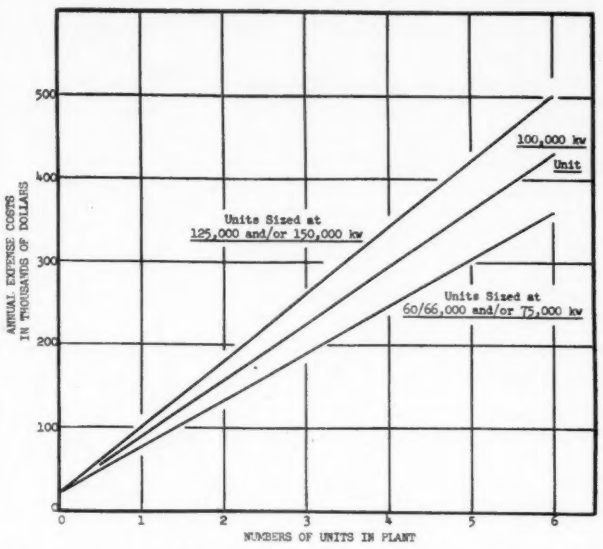
ANNUAL EXPENSE COSTS IN THOUSANDS OF DOLLARS
NUMBERS OF UNITS IN PLANT
100,000 kw Unit
Units Sized at 125,000 and/or 150,000 kw
Units Sized at 60/66,000 and/or 75,000 kw

Figure 6—Comparative Costs, Station Expenses. Units Sized at Net Capability.

all of that ideal objective. This in no way detracts from the objective, but rather gives zest to its attainment.

Table IV shows, on a statewide basis, the additional plant investment and operating costs of all the generating equipment necessary to meet the future load requirements in the three steps of magnitude we have been discussing.

Transmission

The transmission-system plan developed to serve the state took into account the following factors.

1. Existing lines and substations.
2. Existing owned rights of way.
3. Location and magnitude of generating stations, present and proposed.
4. The character of the area through which new lines were projected.
5. Location of loads.

In order to conserve time and insure that the estimates of cost be comparable, the committee agreed on certain cost standards for the major elements encountered in the transmission system.

The problem was to develop a transmission system that would, for the fewest dollars, transport the power from generating stations to load centers. There is no simple formula that will solve such a problem, especially when three levels of load and several alternate new generating sites are involved. After a few cuts and trys it was found that by first concentrating on the 300 per cent or ultimate load and boiling down many transmission arrangements for that level of load to one plan that met all criteria, we could work backward toward the smaller loads ending with present conditions. This method insured that facilities installed from time to time during the earlier years would fit into the ultimate plan. Coming back to the 300 per cent load transmission study, four plans were developed to show the requirements of the transmission system necessary to appraise the advantages or disadvantages of different generating site locations. These four plans are listed below with a brief description.

TABLE IV—ADDITIONAL GENERATING COSTS

	100–150 Per Cent Load	100–200 Per Cent Load	100–300 Per Cent Load
Capacity to be installed	641 mw	1,241 mw	2,416 mw
Net annual generation	3,079 MKwhr	5,380 MKwhr	10,526 MKwhr
Investment	$143,800,000	$259,300,000	$477,300,000
Fixed charges	21,810,000	40,280,000	75,160,000
Annual operating cost	10,570,000	21,620,000	42,910,000
Total production cost	$32,380,000	$61,900,000	$118,070,000
Production cost per kwhr	$0.0117	$0.0115	$0.0112

PLAN A (Fig. 7) provided for the development of a major station near and just east of New Haven, called Branford, and a second plant on The Hartford Electric Light Co.'s South Meadow site, estimated to cost $63,100,000.

PLAN B, in general, provided for the development of a major station on Charles Island, a small island in Long Island Sound located between Bridgeport and New Haven and, as in Plan A, the South Meadow No. 2, estimated to cost $64,600,000.

PLAN C provided for a major generating plant at Haddam on the Connecticut River and South Meadow No. 2, estimated to cost $66,000,000.

PLAN D provided for the development of Charles Island as in Plan B and the Millstone Point site, estimated to cost $80,400,000.

Insofar as practical, each of these plans provided the same reserve in transmission facilities between points of generation and points of load and in general would result in the same level of service.

This study illustrates in a marked way the significance of placing generating capacities near load centers. By comparing Plans B and D, the only difference being that generation at South Meadow is moved to Millstone Point, there is a resulting difference of approximately $16,000,000 in overall cost.

In addition to the studies made of

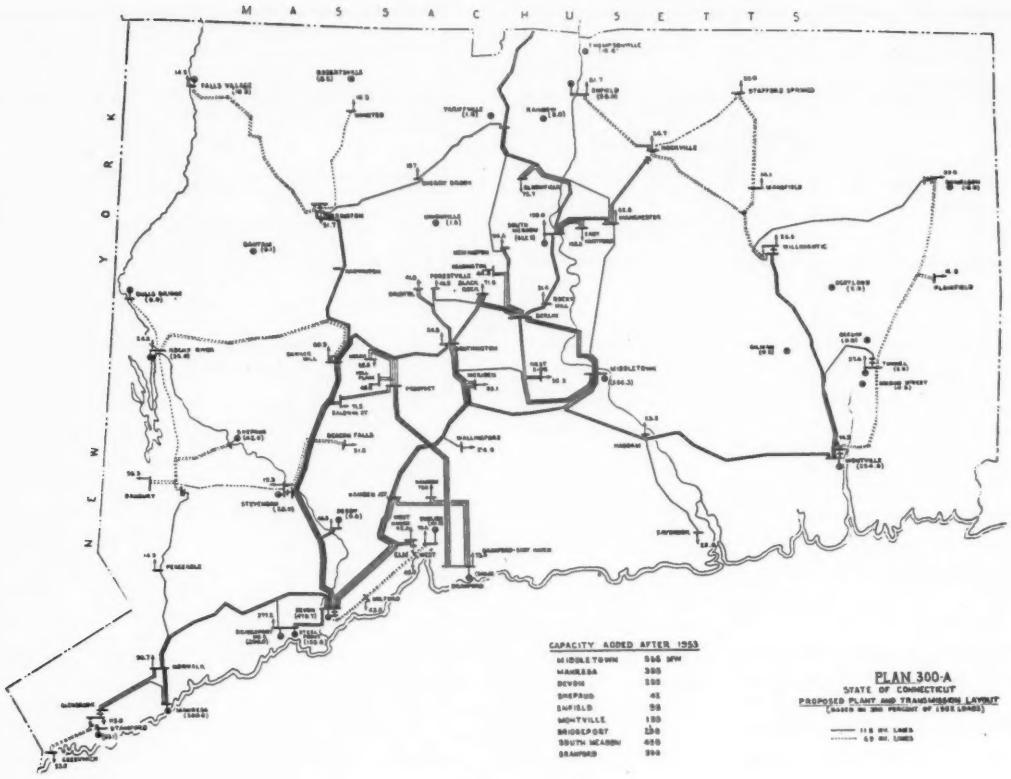

Figure 7

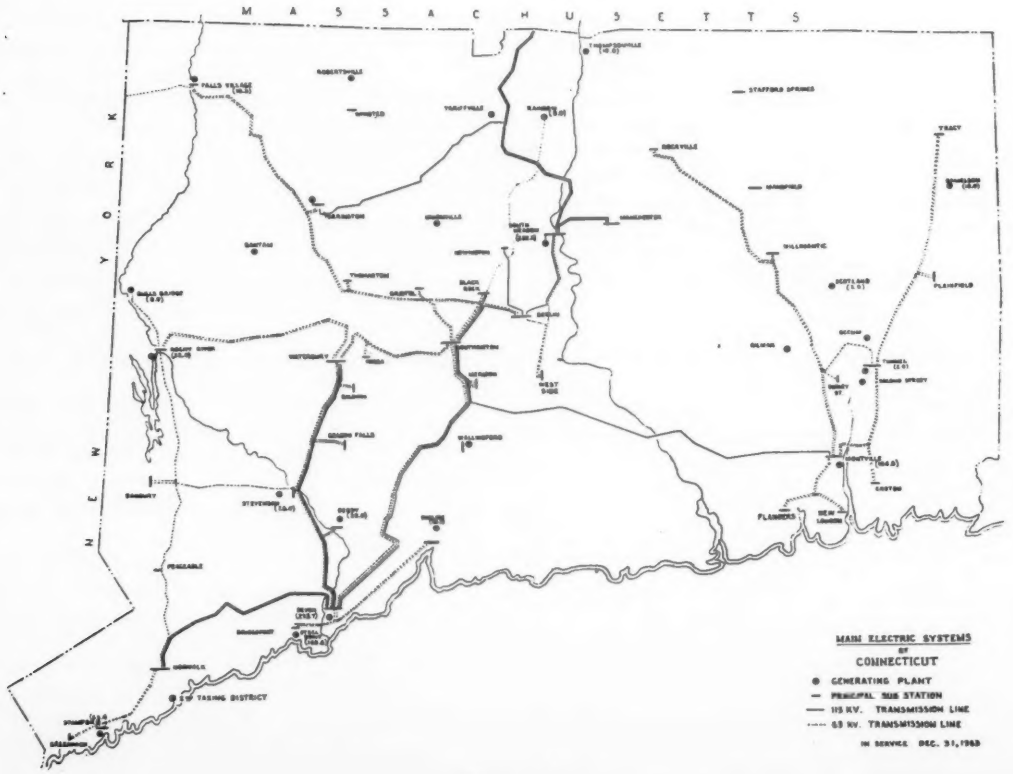
M A S S A C H U S E T T S
N E W Y O R K
MAIN ELECTRIC SYSTEMS
OF
CONNECTICUT
GENERATING PLANT
PRINCIPAL SUB STATION
115 KV. TRANSMISSION LINE
69 KV. TRANSMISSION LINE
IN SERVICE DEC. 31, 1953

Figure 8

TABLE V—ADDITIONAL TRANSMISSION INVESTMENT

Load Growth from	Miles	Rights of Way	Lines	Substation	Total
100–150%	142	$2,400,000	$9,300,000	$11,400,000	$23,100,000
100–200%	179	3,500,000	16,500,000	19,400,000	39,400,000
100–300%	211	4,800,000	28,400,000	29,900,000	63,100,000

the 300 per cent load level, rough checks were made at the 200 per cent load level to make sure that the final selection of a plan was not based on some combination of freak figures. This further check revealed that Plan A was not only the cheapest but likely the easiest to implement.

With the selection of Plan A (Fig. 7) for the 300 per cent load level, studies were made to determine a time schedule for the installation of the many different segments in the transmission system in order to insure adequate time for the acquisition of rights of way and projected station sites. In this connection Fig. 8 is a map indicating the transmission system in Connecticut as it existed at the end of 1953.

In all these studies the line layouts were checked on A. C. Boards. Table V shows the cost of the transmission system in the steps we have been discussing.

It is a simple matter for a large company, adequately staffed and with only normal supervision, to complete a system-planning study of this magnitude. However, it is entirely a different matter when four moderate to small-size companies undertake to make such a study and secure for themselves and their customers economies comparable to those of the large company, and what is more important continue to exist as individual, corporate entities, free to act as such. This can only be accomplished in a game where all the cards are on the table, face up. There is much additional work to be done, not only in planning, but in implementing the plans. As that great philosopher, Toynbee, said in effect, "No society can progress without a challenge." We have a challenge, namely securing for the independent small company all the advantages that inherently accrue to the corporate giant.

Six 1955 National Appliance Campaigns Outlined by EEI

FOLLOWING the successes of 1953 and 1954, six nationally coordinated appliance sales campaigns have been outlined for 1955 by the EEI Residential Promotion Committee. The campaigns, organized to complement the coordinated campaign calendar and designed to give additional customer impact by stressing local activity, follow closely the five 1954 EEI-sponsored campaigns.

Four major appliances, plus electric housewares, are included, tying in with the general industry slogan: "Be Modern . . . Live Electrically." As in last year's campaigns, dealers, distributors, manufacturers, electrical leagues, and local electric light and power companies are encouraged to use campaign themes, times and materials.

The four major electric appliances to be covered in the year-long campaign calendar are: ranges, water heaters, dryers and freezers. To this list, which includes both a spring and fall range promotion, has been added electric housewares in the main gift months. The complete calendar:

Appliance	*Theme*	*Time*
Clothes Dryer	World's Greatest Wife Saver	Jan.-Feb.-Mar.
Range	Cook Electrically—It's Clean	Mar.-Apr.-May
Water Heater	It's Tops—Your Electric Water Heater	Mar.-Apr.-May
Freezer	Buy a Food Freezer Now and Save	May-June-July-Aug.
Range	(To Be Announced)	Sept.-Oct.-Nov.
Housewares	(To Be Announced)	June and Dec.

For each of these special coordinated campaigns, materials — including a display kit and consumer folder —are available from EEI and other organizations which tie in with the campaigns. Details of individual campaigns will be mailed approximately three months before the campaign is scheduled to begin.

As in 1954, four other major appliances are included on the 1955 coordinated appliance calendar. The industry is encouraged to conduct promotions on the appliances at these times, although no special materials will be available.

Dishwashers—Sept.-Oct.-Nov.

Disposers—Sept.-Oct.-Nov.

Air Conditioners—
May-June-July-Aug.

Dehumidifiers—May-June-July-Aug.

The six main coordinated campaigns have resulted from industry agreement that local promotions without national themes and timing result in scattered fire. Using EEI materials as a focal point, electric light and power companies, manufacturers, dealers, distributors and electrical leagues will again be encouraged to conduct local campaigns using locally produced items or those available from commercial suppliers. Thus more customer impact will be assured.

The slogan, "Be Modern . . . Live Electrically," will again be stressed. Adopted last year, it has proven most useful throughout the industry in all advertising and promotional activities.

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EEI Resuscitation Awards

FOR 22 years the EEI Medal has served a dual purpose: to encourage the use of approved manual resuscitation techniques and to honor electric company employees whose application of these techniques, often at great personal risk, results in the saving of human life following electric shock.

During this period, presentation of the EEI Medal also has demonstrated dramatically the need for a continuously dynamic safety program since repeated thorough safety training in the past has been a prime factor in enabling workmen to quickly and efficiently put into effect proper emergency action.

From 1933, when presentation of the EEI Medal was first authorized by the Institute, to the end of 1954, a total of 413 resuscitation cases were approved. On the following pages are summaries of six of those cases, wherein EEI Medals were presented to heroic workmen whose actions in saving the life of a fellow employee embodied devotion to duty, selflessness and preparedness through training.

JOSEPH A. RACZKOWSKI
Consumers Power Company

On the afternoon of October 23, 1953, a Consumers Power Co. crew was adjusting the tension of a three-phase 7200-v primary line on Suida Road in Manistee County, Mich. The phase conductors on the road and field sides of the crossarm were pulled up to proper sag, and just as Lineman Douglas O. Anderson and Sylvester C. Flarity were to install an automatic sleeve on the road phase, the conductor broke near the middle of the span and fell to the ground. Lineman Harold A. Kirk, who was pulling the field phase to help equalize the tension on the other crossarms in the line, tried to avoid the falling conductor but lost his balance then fell on and became entangled in it near a fence which the conductor had energized and which separated him from the road.

Line Crew Foreman Joseph A. Bachinski and Line Truck Driver-Groundman Joseph A. Raczkowski, who were working on the ground on the road side of the fence, managed to avoid the fallen wire by falling on their backs to the ground and rolling away from the wire.

Immediately Foreman Bachinski ran to the nearby truck and obtained rubber gloves and bolt cutters. Bachinski then cut the live wire between the victim and the source of power. The linemen on the pole were able to control the unsecured road phase and made a second cut which severed the hanging wire from the pole, then secured the dangling conductor to the arm and descended the pole. Another cut was made between the energized fence and the wire.

Lineman Flarity aided Truck-Driver Groundman Raczkowski in pulling the unconscious and not-breathing Kirk from the fence and disentangling him from the wire, and Raczkowski immediately started artificial resuscitation. The crew's quick action and alert thinking enabled the beginning of artificial resuscitation within about one minute after the accident.

Meanwhile the fence was burning due to contact with the other end of the broken wire which was still energized by feed back from a transformer. Linemen Anderson and Flarity cut this wire at the transformer pole. Foreman Bachinski had already notified the company's radio operator and medical aid had been summoned.

After approximately 30 seconds of arm lift-back pressure artificial resuscitation, Kirk began to breathe. He was kept covered with blankets until the doctor arrived and began treatment for severe multiple electrical burns and shock. Kirk was hospitalized but was able to return to work in approximately three months.

Examination of the break in the wire indicated that a rifle bullet previously had broken five of the seven copper strands.

For his successful resuscitation, Joseph A. Raczkowski was awarded the EEI Medal while Certificates of

At a Consumers Power Co. banquet in his honor, Joseph A. Raczkowski (fourth from left), receives EEI Medal and citation from Walter Scott, District Manager. Standing (left to right) are Certificate of Assistance winners J. A. Bachinski, D. O. Anderson and S. Flarity. Seated are W. J. Dowsett, Assistant Safety Supervisor (left), and B. D. Hilty, Division Manager.

Assistance were issued to Douglas O. Anderson, Joseph A. Bachinski and Sylvester C. Flarity. Stories of the resuscitation and presentation, which was made on March 8, 1954, at the Hotel Cippewa in Manistee, appeared in the March 9 issue of the Mainstee *News-Advocate*.

KENNETH L. GOODRICK
Pennsylvania Power Company

On the afternoon of May 21, 1953, Pennsylvania Power Co. Linemen Herman W. Smith and Kenneth L. Goodrick were engaged in changing a transformer installation on a pole on Conneaut Lake Road, north of Greenville, Pa. The job was nearing completion when Smith, who had been working on the north side of the pole, contacted the middle phase with his head as he crossed over to the south side of the pole where the middle phase was dead ended.

Goodrick, who had been working below Smith on the secondary line, heard the sizzle of the contact. He immediately moved up the pole to the unconscious and not-breathing victim, who had been thrown clear of contact and had fallen on his back across the transformer crossarm. Holding Smith's head up with one hand, Goodrick began to administer pole top resuscitation with the other arm.

Foreman O. O. Jordan ran to the truck and radioed a call for additional linemen. Goodrick continued to work on Smith some three or four minutes before Linemen Vaughn C. Tower and Ralph E. Snyder, members of different crews, arrived at the accident scene. At this time Smith was just starting to breathe and became semiconscious. Preparations were then made by Snyder and Tower for lowering Smith to the ground. The lowering process down the stepped pole was hampered by the victim's struggle.

Smith was removed to a hospital where he was treated for cerebral concussion as a result of electric shock, first degree burns, and for amnesia. He soon regained complete consciousness, and lost only three days from work as a result of the accident.

At Pennsylvania Power's annual Christmas party, Kenneth L. Goodrick was presented an EEI Medal and Certificates of Assistance were awarded to Vaughn C. Tower and Ralph E. Snyder. The presentations were made by Walter H. Sammis, President of Pennsylvania Power and then President of the Institute. Stories of the rescue and of the award appeared in the *Greenville Record Argus*, May 22, 1953, and December 14, 1953, and *New Castle News*, December 14, 1953.

Pennsylvania Power Co. Lineman Kenneth L. Goodrick (second from left) receives EEI Medal and citation from President W. H. Sammis. H. W. Smith (left), whose life was saved, and Certificate of Assistance winners V. C. Tower and R. E. Snyder look on.

B. S. DOHRMANN
Pacific Gas and Electric Company

Apprentice Electrician George A. Salsbury was working from an elevated position, approximately five feet above the floor in Pacific Gas and Electric's Emeryville Electric Shop, shortly after noon on April 30, 1953. As he was tightening the jam nuts on the studs in the tap changer compartment of a 150-kva, 12,000-v step-type regulator, Salsbury screamed. Electrician W. E. Blair, standing by the side of the regulator, cut the power supply by pulling the wires from the regulator, for which it is believed that the supply lines contacted the potential winding terminals. Salsbury fell backward from the ladder to the floor, where he lay unconscious and not breathing.

Electrician Patrick F. McEvoy called Electrician B. S. Dohrmann, who was working nearby. Dohrmann arrived at the accident scene within seconds and, as he prepared the victim for artificial respiration, called instructions to other workmen. He then began the administration of Holger-Nielson artificial respiration, and continued the process for approximately two minutes before there was any sign of life. About four minutes after the accident occurred, Salsbury was able to breathe without help.

Another employee, Frant Baldridge, who had been working on the same regulator, also received an electric shock but was not rendered unconscious.

Salsbury was treated at a hospital for electric shock, first and second degree burns, and abrasions. He was able to return to work after the loss of two working days.

For his resuscitation action, B. S. Dohrmann was awarded the EEI Medal. Presentation of the medal was made by Raymond W. White, Manager of the Department of Claims and Safety, at a luncheon held on Feb. 9. A story of the award presentation appeared in the *Oakland Tribune* on January 28, 1954.

W. N. WATTS
Mississippi Power Company

In Long Beach, Miss., on the afternoon of September 9, 1953, a Mississippi Power Co. crew was completing a routine assignment of setting a new pole and making a new transformer installation on the new pole to which all wires were to be transferred from an old pole which would be removed.

The tap line on which the crew was working had two primary wires on it, one of which was not connected since it had been a 2300-v line before conversion to 4 kv was made. The east-phase wire of the old primary line was the one which was left energized and feeding the old transformer installation on the line, but the extra wire was not removed when the conversion was made. Because of a bad tree condition, the new transformer was installed for connection to the west phase.

Left to right are: D. McCulloch, Mississippi Power Co. Safety Supervisor; K. C. Vick; EEI Medal winner W. N. Watts; EEI Medal Miniature winner B. R. Burril; Jake Shaw; M. L. Castello; and J. T. Dalier, Division Manager for Mississippi Power. Vick, Shaw and Castello are holding their Certificates of Assistance.

Line Foreman K. C. Vick had sent Lineman G. F. Fayard and Winch Truck Driver Operator M. L. Castello to the junction pole to prepare to make the west phase "hot" to feed the new transformer installation when the workmen on the transformer pole were ready. Fayard was to remove the jumper from the east phase wire of the tap line and install it on the west phase wire. When preliminary work had been completed by both groups of workmen, Fayard removed the jumper and had reconnected one end of it permanently to the west phase of the tap line. He was in the process of placing the other end in the connector on the main line when his left arm contacted the live jumper and his left leg touched the naked neutral.

Members of the crew saw the arc, and Castello, as he cried for help, grabbed the hand line which was fastened to a hook on Fayard's belt, pulled down on it, and succeeded in freeing the victim from the energized jumper. Lineman W. N. Watts, at work atop the other pole, quickly descended, ran to the accident scene, and climbed to Fayard. After cutting a street light lead, Watts got below Fayard, and because he was unable to get the victim into his belt, placed the top of his head against Fayard's back and started pumping from below.

Lineman B. R. Burril followed Watts up the pole and removed the jumper from the line so that it would be no further hazard to the rescuers. He then tried to remove Fayard's safety belt but when he was unable to do so, Burril cut it and placed the victim, who was beginning to show signs of life, on Watts' safety belt in a sitting position.

Apprentice Jake Shaw then went up the pole on the opposite side from Watts, removed Fayard's hooks and tools, and fastened into Fayard's belt a rope which had been thrown over the double crossarm so that the men on the ground could assist in lowering the victim to the ground. Watts and Burril, continuously applying artificial respiration, then lowered Fayard down the pole in their belts.

On the ground, the resuscitation was continued under the direction of a physician. In all, artificial respiration was applied for approximately 25 minutes before Fayard could breathe without assistance, although the victim had shown signs of breathing after about two minutes of pole top resuscitation.

Fayard was hospitalized for severe third degree burns, but after a lengthy recovery, was able to return to his job.

In recognition of their successful resuscitation, an EEI Medal was awarded to W. N. Watts and a Medal Miniature to B. R. Burril. Certificates of Assistance went to M. L. Castello, K. C. Vick, and Jake Shaw. The awards were presented by S. L. Muths, Vice President and General Manager, at a meeting of Gulf Coast Division employees.

ROGER D. BRAATZ

Wisconsin Electric Power Company

Following a heavy early-morning rainstorm on July 20, 1953, a Wisconsin Electric Power Co. line crew was installing two arm guy wires between an electric company pole on one side of Port Washington Road in Glendale, Wis., and two telephone poles on the opposite side of the road.

Lineman Emil Trinitapoli had finished installing the ends of the guys on the electric company pole about midway between a 3810-v primary crossarm and a 26.4-kv transmission line buck-arm and had lowered the rubber line hose and insulator hoods from the six primary wires by means of a hand line. The hand-line pulley was fastened to the body of the pole above the primary crossarm and, in order to remove it, the bare-headed Trinitapoli hooked his left arm around the pole and raised himself in his safety belt. He looked up to see if he was clear of the wires and it was then that his right forehead contacted a primary phase wire. Ground contact was made either through a telephone wire attached to the pole or through moisture on the pole which had been drenched by the heavy rain earlier in the morning. Trinitapoli, unconscious and gasping for breath, slumped back in his belt, clearing himself from contact when he did.

Lineman Roger D. Braatz was installing one of the guys on a telephone pole across the road. Lineman Helper Louis Willard, following Braatz's instructions, took a pull on the blocks to tighten the guy wire and then he and Braatz both looked toward the electric company pole to see how taut

the guy was. They saw Trinitapoli leaning back in his belt, his head bobbing and one arm jerking. Braatz immediately went down the telephone pole, ran to the truck for his rubber gloves and then across the road to the electric company pole. Willard ran to the truck for the life line and called Foreman Harry Klabunde, who was checking some work done on a customer's premises. Klabunde and Willard took the life line across the road, where Braatz, his rubber gloves on, hooked it on his belt and climbed the pole. Reaching Trinitapoli, who was no longer breathing, he positioned himself and started administering pole-top resuscitation. About one minute had elapsed between the time when Trinitapoli received the shock and Braatz started resuscitation.

After two minutes of resuscitation Trinitapoli started to breathe and his arms began to jerk. Braatz flipped the life line over the primary crossarm and put the belt around Trinitapoli's chest. As Braatz tried to lower him, Trinitapoli, mentally confused, struggled and jabbed his hooks into the pole preventing Braatz from letting him down. Arriving at that time, Myron Dotson, a Wisconsin Electric Power Troubleman who had been nearby and heard the report of the accident over the short-wave radio in his car, climbed up to help Braatz. He took one of Trinitapoli's legs while Braatz took the other and together they guided him down, laying him on the rubber blankets that Willard had spread on the ground. By this time Trinitapoli was breathing naturally, although he was still irrational. The rescue squad arrived and Trinitapoli was put into the ambulance and rushed to the hospital where he was treated for small second and third degree burns on his left thigh and left upper arm and first and second degree burns on his forehead. His injuries kept him out of work for 55 days. No permanent disability resulted from the accident.

For his life-saving action, Roger D. Braatz was awarded the EEI Medal and Harry Klabunde, Louis Willard and Myron Dotson received Certificates of Assistance at an informal ceremony on July 2, 1954, at which, Carl F. John, Vice President of the company officiated. A story of the award presentation appeared in the August, 1954, issue of the company's house organ, *The Outlet*.

GUY C. HIGGINS

Virginia Electric and Power Company

The assignment of Foreman L. S. Painter's Virginia Electric and Power Co. crew for the afternoon of September 21, 1953, was to relocate a single-phase 3450-v line in Newport News, Va. Lineman Second Class C. B. Mills had climbed the pole to assist in making a permanent tie of a conductor.

As Mills' right hand contacted a live wire while his leg was against a guy wire, there was an arc. Mills slumped, releasing his hand from contact, but in slumping his face and ear fell against the hot conductor. Attempts by another worker on the same pole to free Mills were unsuccessful. Meanwhile, Lineman First Class Guy C. Higgins, who had been working atop a pole across the street, had been called for assistance.

Upon reaching the top of the pole on which the accident had occurred, Higgins kicked Mills' foot free from the contact, straightened the victim, and immediately began giving pole top resuscitation to him. After several minutes of treatment, Mills began breathing again and was lowered to the ground, then taken to a hospital where he was treated for third and second degree burns.

Guy C. Higgins was awarded the EEI Medal for his successful resuscitation action. Presentation of the award was made by Assistant Vice President J. B. Hawkins at a banquet in the Oasis Restaurant. Witnessing the presentation was C. B. Mills, the man whose life Higgins saved. Stories of the rescue and award appeared in the *Newport News Times-Herald* on February 11 and 13, 1954, and in the April issue of the company magazine, *The Vepcovian*.

Guy C. Higgins (center), Virginia Electric and Power Co. Lineman, receives EEI Medal from J. B. Hawkins, Assistant Vice President of the company, as C. B. Mills, whose life was saved, looks on.

Texas Power & Light Co. Receives Ebasco's Gold Award

THE Ebasco Gold Award for outstanding achievement in safety was presented to Lee E. Cook, Vice President and Assistant General Manager of Texas Power & Light Co., and C. J. Rutland, head of the company's safety program, by H. H. Scaff, Vice President of Ebasco, at a meeting of Ebasco client company executives in New York on November 30. In presenting the award to Texas Power & Light, which had achieved an Injury Index of 94.75 per cent below the national average for the 1953-1954 award year, Mr. Scaff commended the company's fine record, and commented on the fact that earlier this year, this company had established a record for the electric utility industry by reaching 5,168,170 man-hours without a lost-time accident.

Achievement Certificates, awarded to those companies bettering the National Injury Index by more than 25 per cent, also went to Dallas Power & Light Co., Carolina Power & Light Co., West Tennessee Gas Co., Pacific Power & Light Co., Columbus Transit Co. and Mid South Gas Co.

Electric Industry in 1954

(*Continued from page* 4)

from further refinements in equipment and operational improvements, increases in efficiency of new plants and, as noted before, the constantly expanding average consumption of electricity by the domestic consumer under promotional rate schedules.

Farm Service

By the end of 1954 an estimated 5,090,000 farms had electric service, 94.6 per cent of the over-all farm figure. All but 2 per cent of the nation's occupied farms now either have electric service or have it readily available.

Rate Increases

Regulatory commissions continue to recognize the effects of postwar inflation on construction and operational costs and tax payments, through the approval of rate adjustments necessary to insure the financial strength on which continuance of adequate electric service to the nation depends.

Four hundred and thirty-one applications for rate increases were made by the electric companies from 1946 through the first 11 months of 1954, according to records of the Edison Electric Institute. Of these, 386 applications were granted, 21 are pending action, 11 were withdrawn, and 13 denied.

The 1954 record shows 39 actions by the Commissions. Applications pending are 16. Twenty-two were granted and one denied.

Revenues Increase

Gross revenues of the investor-owned electric companies were $6,305,000,000 in 1954, an increase of 6.1 per cent, and more than double gross revenues in 1946. Net income of the companies was $1,165,000,000, an increase of 11.9 per cent over 1953. Net income was double that of 1945.

Expenses Continue to Mount

For the fifth straight year taxes have been the largest item of the electric companies' expenses. In 1954 taxes, Federal, state and local, consumed $1,447,000,000 of electric operations revenues, or 23 per cent. Taxes increased 8.1 per cent over 1953. Federal taxes were $888,000,000 and state and local, $559,000,000.

Wages and salaries totaled $1,226,000,000 in 1954, an increase of 6.2 per cent over 1953. Fuel, the third highest item, was $995,000,000, down 1.9 per cent from 1953.

Increasing Efficiency in Fuel-Burning Stations

Increasing efficiency in fuel-burning stations brought downward the coal consumption per kilowatthour generated from an average of 1.06 lb per kwhr in 1953 to 0.99 lb in 1954. Ten years earlier the comparative figure was 1.29 lb per kwhr.

In 1882 it required ten pounds of coal to generate one kilowatthour of electricity. If there had been no continuing efficiency improvement, this year's fuel consumption would have been 1,800,000,000 tons of coal or equivalent in oil and gas, instead of the approximately 180 million tons actually consumed.

What would have been one year's supply has now become ten years' supply, and a convincing demonstration of real conservation of natural resources.

Over 200 Attend Second Electronics Accounting Machine Seminar

MORE than 200 registrants attended the second Public Utility Electronics Accounting Machine Seminar sponsored by the EEI and AGA Accounting Division Electronic Accounting Machine Developments Subcommittees on December 6, 7 and 8, 1954, in the East Ballroom of the Hotel Commodore in New York City.

This seminar, which was arranged primarily for interested employees from member companies of both associations, opened at 10:00 a.m. on Monday, December 6 with introductory remarks by O. K. Boyd, Consolidated Gas Electric Light and Power Co. of Baltimore, Chairman, EEI Accounting Division Executive Committee. An introduction of the membership of the joint EEI-AGA Subcommittees on Electronic Accounting Machine Developments followed the opening remarks.

The intent of the seminar this year was to illustrate practical applications of the use of existing electronic equipment to the operations and problems of the electric and gas utilities. Companies represented on the program included Remington Rand, Inc., Addressograph-Multigraph Corp., Underwood Corp., Radio Corp. of America, Electro Data Corp., Burroughs Corp., National Cash Register Co. and International Business Machines Corp.

Included in the presentations by the various companies were descriptions of applications to customer billing and to inventory and accounting control of materials and supplies. General interest and discussions were promoted through question and answer periods following each presentation. In various instances projected illustrations and charts and diagrams supplemented verbal presentations.

Following the office equipment manufacturing companies' presentations, a brief statement of the planning positions of a few utilities was conducted by the chairmen of the respective EEI-AGA Subcommittees on Electronic Accounting Machine Developments, W. J. Ott, The Cincinnati Gas & Electric Co., and J. C. Messer, The Peoples Gas Light and Coke Co. Participating in the informal discussion were F. J. Porter, Jr., Consolidated Edison Co. of New York, Inc., J. D. Elliott, The Detroit Edison Co., R. H. Smith, The Cleveland Electric Illuminating Co., and R. Britt, Wisconsin Electric Power Co.

EEI Publication

Specification for Test Switches for Transformer Rated Meters

EEI Pub. No. MS-9. A Specification issued by the AEIC Committee on Metering and Service Methods and the EEI Meter and Service Committee. 6 pages. Price: 25 cents.

This specification is intended to encompass the dimensions and functions of meter test switches with transformer rated watthour meters in conjunction with instrument transformers. The provisions of the specification represent the consensus of a large majority of the industry.

Fatal Accidents in the Electric Light and Power Industry

By S. H. Young
The Hartford Electric Light Company

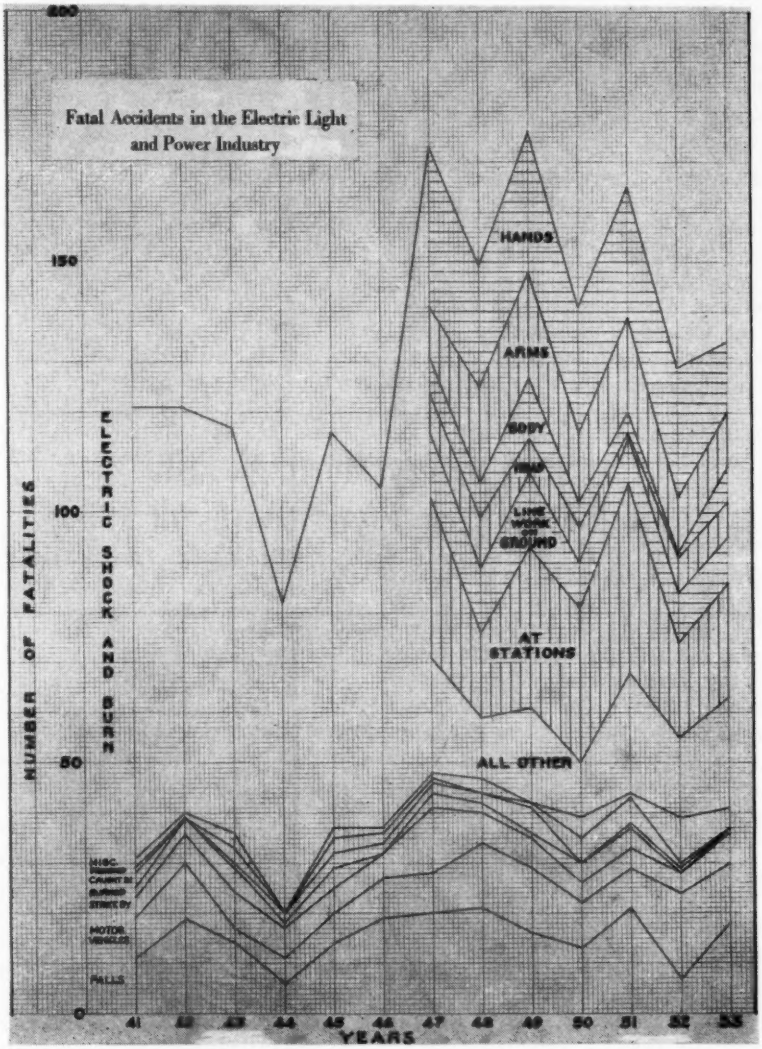
IN 1953 there were 134 fatal accidents to employees of the electric light and power industry. Compared with past records this was a good year, as the following summary shows:

Year	Frequency	Severity	Fatalities per 1000 employees
1953	9.43	1.55	0.37
1952	11.06	1.66	0.39
1951	11.06	2.00	0.51
1950	11.96	1.96	0.47
1949	11.02	2.37	0.60
1948	14.80	2.11	0.53
1947	15.41	2.39	0.64
1946	14.81	1.72	0.41

The fatality rate of 0.37 per 1000 employees for 1953 is the lowest on record. The same is also true for both the severity and frequency rates.

Electric shock and burns were responsible for 69.4 per cent of the deaths. This is very close to the 13-year average of 71 per cent. Falls were responsible for 13.4 per cent and motor vehicles for 9 per cent. (See the accompanying table, "Distribution of Accident Types by Percentages," for a more complete comparison.)

Perhaps we should be satisfied to make each year better than the one previous. If we are to do more than this, we should also carefully study the causes for these fatal accidents. We would find that most were due to the same reasons year after year. The reasons most generally given were failure to use protective equipment, unsafe work practices, unsafe work position, faulty work plan, and failure to follow instructions. Let us go back one step further and ask what is being done to persuade our men to cover up properly, to wear protective gear, to place themselves in a safe work position, to follow instructions and not cut corners. The man that contacts a primary wire that he has not covered up because it would take longer to put on a few



DISTRIBUTION OF ACCIDENT TYPES

(By Percentages of Total Accidents)

	1953	13-Year Average	13-Year Range Minimum	13-Year Range Maximum
Electric Shock or Burn	69.4	71.0	64.7	76.0
Falls	13.4	11.5	5.4	18.1
Motor Vehicles	9.0	7.0	2.6	13.2
Struck By	4.5	4.4	3.1	7.5
Burned	0.7	1.7	0	4.3
Caught In	0.0	1.3	0	2.8
Drowned	0.0	1.3	0	3.5
Miscellaneous	3.0	1.6	0	3.9
No Data	0.0	0.2	0	3.1

THIRTEEN YEARS OF FATAL ACCIDENTS IN THE ELECTRIC LIGHT AND POWER INDUSTRY, 1941 TO 1953, INCLUSIVE

(From EEI Accident Prevention Committee Summaries)

Year	Total	Electric Shock or Burn	Falls	Motor Vehicles	Struck By	Burned	Caught In	Drowned	Miscellaneous	No Data
1941	121	90	11	8	4	2	3	1	2	
1942	121	81	19	11	6	3	0	0	1	
1943	117	81	14	3	7	5	1	3	3	
1944	82	62	6	5	6	1	2	0	0	
1945	116	79	14	6	5	4	3	3	2	
1946	105	68	19	8	5	0	2	2	1	
1947	173	125	20	8	13	3	2	1	1	
1948	149	102	21	13	6	2	2	0	3	
1949	176	134	16	13	6	1	5	1	0	
1950	141	102	13	9	4	4	0	5	4	
1951	165	121	21	8	4	4	1	5	1	
1952	129	90	7	17	4	0	1	1	5	4
1953	134	93	18	12	6	1	0	0	4	0
Total	1,729	1,228	199	121	76	30	22	22	27	4

lengths of line hose and then do the job at hand is not the only one at fault. Basically, his company must share the blame because of its failure to enforce safe work practices.

If improvements in our accident prevention records are to keep pace with other phases of our fast expanding industry, we must do more than make rules and regulations. We must provide our men with training and instructions and see to it that they are followed—not only part of the time, but at all times.

41 EEI Safety Merit Awards Presented in Last Five Months of 1954

IN THE five months between August 1 and December 31 a total of 41 EEI Safety Merit Award certificates were presented, three of which were for the accumulation of 3,000,000 man-hours of accident free operation. The award to Texas Power & Light Co. for 5,000,000 accident-free man-hours was reported on page 329 of the September BULLETIN, but since the certificate was not presented until August, Texas Power & Light has been included in this report also.

The 41 certificates were presented to the following list of companies:

Alabama Power Co.
- Birmingham Division 1,001,129
- Electric Operations 1,168,226
- Electric Operations 1,134,055
- Production Department 2,241,589
- Southeast Division 2,000,000
- Southern Division 1,001,577

The Cleveland Electric Illuminating Co.
- Distribution Group 1,000,000
- Electrical Division 1,006,400
- Entire Company 1,490,000
- Entire Company 1,130,000
- Lines Division 1,000,000

Consolidated Edison Co. of New York, Inc.
- Commercial Buildings—Operation Bureau 1,000,000
- Distribution Operation—Service 2,000,000
- Station Construction & Shops—Holder Maintenance & Painting Bureau 3,000,000
- Substation Operation—Substation & Gas Holder Operation Bureau 1,000,000
- Waterside Station 1,000,000

Consolidated Gas Electric Light and Power Co. of Baltimore
- Electric Operations 1,051,694
- Electric Operations 1,382,529
- Power Production Stations. 1,021,599

Consumers Power Co.
- J. C. Weadock Steam Plant. 1,027,417

The Detroit Edison Co.
- Overhead Lines Department 1,085,528
- Electrical System 2,104,936
- Underground Lines Department 1,040,763
- Construction & Maintenance Dept.—Trenton Channel Division. 1,033,626
- Substation Department 1,079,080

Kansas Gas and Electric Co.
- Entire Company 1,005,430

Louisiana Power & Light Co.
- Entire Company 1,276,203

Monongahela Power Co.
- Entire Company 2,195,224

Minnesota Power & Light Co.
- Little Falls Division 1,000,000

Narragansett Electric Co.
- Electrical Operation Department 2,000,236

New Jersey Power & Light Co.
- Entire Company 1,317,161

New Orleans Public Service Inc.
- Lines Section—Electric Distribution Division 1,032,696

The Ohio Power Co.
- Eastern Division 3,000,000

Pennsylvania Electric Co.
- Seward Station 1,026,048

Public Service Co. of Oklahoma
- Entire Company 2,376,241

Southern California Edison Co.
- Northern Substation Division 1,024,232
- Substation Division 1,064,007
- Communication Division ... 1,000,550

Southwestern Public Service Co.
- Entire Company 2,000,000
- Entire Company 3,000,000

Texas Power & Light Co.
- Entire Company 5,168,170

Several 2,000,000 man-hour certificates presented acknowledged impressive records. The Southeast Division of Alabama Power Co. reached the 2,000,000 man-hour mark on October 22, having worked from July 30, 1948, without a disabling-injury accident. Narragansett Electric Co.'s Electrical Operation Department worked continuously without a mishap from February 18, 1947, to October 1, 1954, accumulating 2,000,236 man-hours of accident-free operation.

Southwestern Public Service Co. achieved the 2,000,000 man-hour mark, then went on to reach the 3,000,000 man-hour mark within the same period.

For the calendar year 1954 there were 81 Safety Merit Award certificates presented to 30 different companies. This compares to a total of 63 such certificates in 1953, to 34 different companies.

Vincent C. Brennan

VINCENT C. BRENNAN, Vice President—Personnel, Union Electric Co. of Missouri, died Oct. 10 at his home in Clayton, Mo., after an illness of several months. He was 58 years old.

Mr. Brennan joined Union Electric in 1942 as executive director of personnel and was named a vice president in 1947. Earlier in his career he had been employed by the Tidewater Associated Oil Co. of New York and the Texas Co.

At the time of his death Mr. Brennan was a member of the EEI Industrial Relations Committee, on which he had long been active. During World War II he served on the industrial training panel of the War Production Board.

Review and Classification of 134 Fatal Accidents Reported During 1953
Within the Electric Light and Power Industry
Edison Electric Institute Accident Prevention Committee

(This summary was compiled from detailed reports submitted to the Institute)

			PATH OF CURRENT: VICTIM Entry	VICTIM Exit	EQUIPMENT Energized	EQUIPMENT Ground	Voltage	Occupation	DESCRIPTION
ELECTRIC SHOCK OR BURN 93 CASES 69.4%	LINE WORK ON POLES 55 CASES	CONTACTS ESTABLISHED WHILE CLIMBING OR WORKING IN WORKING POSITION BUT WITHOUT CUTTING OUT OR LOSING BALANCE	L-Thumb	R-Thigh	Pri. Wire	Guy Wire	1387-2400	Foreman	1. Installing guy over pri. circuit to be abandoned. Contacted pri. still alive from backfeed.
			L-Hand	Back	Pri. Cutout	Tree Limb	2400-4000	Lineman	2. Completed connecting trans. Removed rubber gloves to remove glasses. Made contact.
			Hands	Groin	Live St.Lt. Arm	Tel. Cable	2400-4000	App. Lineman	3. Replacing thru-bolt on st.lt. mast-arm. Pushed suspension rod against primary.
			L-Hand	R-Side	St.Lt. Cond.	Sec. Neut.	2400-4160	Lineman	4. Changing pins on st.lt. circuit. Wind blew primary and st.lt. wires together.
		HANDS	L-Hand	L-Foot	Guy Wire	Steel Struct.	2400-4160	Lineman	5. Slacked guy wire off onto HV bushing of transformer. No gloves or rubber protection. (No. R.G.)
			Fgr.-L-Hand	L-Foot	St.Lt. Wire	Sec. Neut.	4800	Lineman	6. Belting in. Leaned on dead st.lt. wire. Pin on st.lt. broke allowing it to contact primary.^
		14	L-Hand	R-Arm	Pri. Jumper	Treated Pole	6900-12000	Lineman	7. Changing trans. In reaching up for bolt cutter, contacted jumper.
			R-Hand	R-Foot	X-arm Brace	Sec. Neut.	7200	Lineman	8. Replacing X-arms with hot sticks. Tie wire touched wood X-arm; charge passed thru 22" wood X-arm.
		CASES	L-Hand	L-Thigh	Pri. Fuse	Neut. Wire	7200	Serviceman	9. Checking radio interference. Grasped fuse tube alive from backfeed.
			R-Hand	L-Thigh	Pri. Tap	Neut. Tap	7200	Lineman	10. Clearing trouble. Reached over and contacted adjacent energized wire.
			L-Hand	L-Foot	Pri. Tap	Creo. Pole	7200-11000	Lineman	11. Disconnecting transformer. Contacted riser wire above cutout.
			Hand	Hand	Neut. Grd.	Neut. Grd.	12000	Lineman	12. Opened ground connection putting himself in series between driven ground and trans. ground.
			L-Hand	L-Leg	HV Wire	Guy Wire	38200-66000	Lineman	13. Checking insulator for flashover on line believed dead. Placed hand too close to conductor.
			R-Hand	L-Leg	HV Tap	Tower	Induced Volt.	Lineman	14. Removed grounds from 66KV line. After removal, contacted tap.
			Arm	—	Sec. Wire	Tel. Cable	120-240	Lineman	15. Connecting transformer. Brushed against sec. wire while in contact with tel. cable.
			L-Arm	L-Arm	Pri. Tap	Sec. Wire	2300-4000	Lineman	16. Loosened wire lashing two poles together. Climbed into pri. area. Contacted pri. tap.
			L-Elbow	Hands	Pri. Wire	Gin Chain	2400-4160	Lineman	17. Removing trans. gin pole. While chain on gin pole touched gr. rod, contacted pri. with elbow.
		ARMS	L-Forearm	R-Thigh	Pri. Wire	Sec. Neut.	2400-4160	Lineman	18. Tying in pri. wire. Contacted bare sleeve. Line hose had been pushed back.
		11	R-Upper-Arm	R-Foot	Pri. Cutout	Creo. Pole	2400-4160	App. Lineman	19. Reached for rubber blanket on X-arm. Contacted top of pri. cutout.
			Forearm	Foot	Pri. Wire	Trans. Case	6900	Lineman	20. Working 6.9KV with rubber gloves instead of hot sticks. Contacted tie wire above rubber gloves.
			L-Upper-Arm	R-Foot	Pri. Wire	Gr. Wire	7200	Maint. Man	21. Working between phase wires. No rubber goods used. Made contact.
		CASES	L-Upper-Arm	R-Foot	Jumper	Neutral	7000-12000	Lineman	22. Installing jumper on dead wire. End of jumper flipped up into primaries above.
			R-Elbow	L-Side	Common Neut.	Guy	6900-12000	Serviceman	23. Checking low voltage; standing between guy & secd. neut. Rec'd pri. shock - poor ground condition.
			R-Forearm	L-Foot	Pri. Wire	Trans. Case	7200	Lineman	24. Stringing in third wire. Failed to use adequate rubber protection.
			L-Forearm	R-Leg	St.Lt. Wire	Sec. Neut.	1300	Lineman	25. Working on st.lt. wire crossed with 2300V pri. Tie wire hit arm above rubber glove.
		SHOULDER	L-Shoulder	R-Foot	Pri. Wire	Trans. Hanger	2400	Lineman	26. Completed dead-ending neutral. Raised up and contacted live primary above.
		4	R-Shoulder	Body	Pri. Wire	Pri. Wire	2300-4000	Lineman	27. Working on dead 12KV line above uncovered live 4KV line. Made contact.
		CASES	R-Shoulder	Feet	St.Lt. Wire	Grd.St.Lt.Chain	2400-4800	Lineman	28. Clearing trouble between 4.8KV line and st.lt. circuit. Contacted uncovered wire.
			L-Shoulder	L-Hand	Pri. Wire	Pole	7620	Lineman	29. Tieing in wire with hot line tools. Wire came out of clamp on lift pole and fell.
			Chin	—	Trans. Lead	Unknown	240	Troubleman	30. Getting into position to disconnect sec. leads of defective trans. Made contact.
		HEAD	Head	R-Foot	Pri. Wire	Sec. Wire	2400-4000	Lineman	31. Made primary contact while rubbering up for primary changeover.
			Back of Ear	L-Leg	Pri. Wire	Sec. Wire	2300-4000	Lineman	32. Relocating primary wire. Loose end of cut wire struck victim.
		7	Head	L-Knee	D.E. Clamp	Sec. Wire	4800	Lineman Helper	33. Reaching to cut tap on field wire; head contacted uncovered dead end clamp.
			Side of Face	Feet	Pri. Wire	Sec. Wire	4150-7200	App. Lineman	34. Made contact with pri. supposed to be dead. Circuit still alive from parallel trans.
		CASES	Head	L-Hand	D.E. Clamp	Neut. Wire	6900-12000	Troubleman	35. Checking radio interference. Head contacted primary dead end clamp.
			Side of Head	L-Thigh	Pri. Wire	Sec. Neut.	7200-12000	Lineman	36. Installing hitch to remove wire. Turned and contacted primary phase wire.
			Chest	R-Thigh	Pri. Wire	St.Lt. Wire	2300	Lineman	37. Lowering wires from temp. to original position. Made contact between pri. and hot st.lt. wire.
		BODY	Body	—	Pri.	—	2300-4000	App. Lineman	38. Shifting position on pole caused coffing hoist on "A" phase to swing into "B" phase disc.
			R-Hip	R-Arm	Pri. Wire	Pole	2300-4000	Lineman	39. While belting in, pliers in holster went up under blanket and contacted pri. wire; fell 30' to ground.
		7	R-Side	Feet	Pri. Wire	Pole	7200	App. Lineman	40. Removing protective covering. Removed nearest pri. first. Reached across X-arm. Made contact.
			Chest	Legs	Conductor	Guy Wire	7200-12480	Lineman	41. Measuring for jumpers with metallic tape on hot stick. Contacted live conductor.
		CASES	L-Hip	R-Foot	Conductor	Pole	7620-13000	Lineman	42. Repairing pri. at night. Line re-energized when man at disc. saw lights on truck blink.
			Back	L-Hand	Fuse Switch	Guy Wire	7620-13800	Serviceman	43. Climbing to work position. Contacted fuse switch. Fell 40' to ground.
		NECK	Neck	Feet	Pri. Wire	Neutral	2400-4160	Serviceman	44. Repairing neutral from aerial ladder. Raised up into primary wire.
		2 CASES	Back of Neck	L-Foot	Pri. Wire	Thru-bolt	4800	Serviceman	45. Replacing trans. Climbed too high. Contacted primary. No rubber protection used.
		LEG	R-Knee	R-Hand	Lt.Arr.Lead	Gr.Wire Tap	2400-4160	Lineman	46. Belting in at arrester X-arm. Knee contacted arrester lead. No rubber gloves or covering.
		FOOT	R-Ort-Toe	L-Index Finger	Trans. Case	Gr. Wire	2400	Lineman	47. Standing on trans. case which became alive when case ground was disconnected.
		2 CASES	L-Foot	L.Leg & L.Arm	Trans. Hanger	Sec. Wires	2300-4000	Lineman	48. Stringing wire. Victim shifted position so foot contacted hanger on defective trans.
		No Contact -- Flash Burns					2400-4160	Lineman	49. Replacing temp. jumper. Made tap to wrong wire causing phase to phase short.
		3 Cases					4160-6900	Lineman	50. Installed jumper across two phase wires in error. Flash resulted.
							67000-115000	Tower Line Mech.	51. Putting steel re-enforcing on tower. Flash occurred. Cause undetermined.
		CUTOUT OR LOSS OF BALANCE 4 CASES	R-Hand	Legs	Pri. Wire	Sec. Neut.	2300-4000	Subforeman	52. Had shifted pri. to new pole. Victim stood on top arm of old pole. Lost balance; contacted pri.
			R-Hand	L-Hand	Trans. Lead	Gr. Wire	6900-12000	Lineman	53. Cut out while shifting position. Contacted trans. pri. lead. Not wearing rubber gloves.
			L-Hand	L-Leg	Conductor	Tower Brace	Induced Volt.	App. Lineman	54. Lost balance. Grasped de-energized ungrounded conductor. Received shock and fell to ground.
			—	—	St.Lt.Bracket	Pole Grd.	St.Lt. Cir.	Foreman	55. Contacted pole ground hot from defective st.lt. Cut out and fell 25' to ground.
LINE WORK ON GROUND 8 CASES		Energized Wire	Hands & Arms	Feet & Body	New Wire	Earth	4800	Lineman	56. Six man crew pulling in third wire. While pulling excess slack, wire raised up into primary.
		Energized Wire	Hands & Arms	Feet & Body	New Wire	Earth	4800	Lineman	57. Same as 56, triple fatality.
		Energized Wire	hands & Arms	Feet & Body	New Wire	Earth	4800	Lineman	58. Same as 56, triple fatality.
		Energ. Digger	Hand	Feet	Winch Line	Earth	4000-7200	Groundman	59. Victim picked up winch line as digger was moved against live wire.
		Energized Boom	Hands & Leg	Feet	Winch Line	Earth	7200	Line Foreman	60. Holding cable hook while truck with boom up backed under line and made contact.
		Energ. Truck	Hands & Side	Feet	Truck Door	Earth	7200	App. Lineman	61. See No. 60, double fatality. Victim was removing gloves from truck compartment at time of contact.
		Energized Wire	Hand	Feet	Wire Reel	Earth	7200-12500	Lineman	62. Tending brake on reel while pulling in wire under hot circuit. Contact made seven spans away.
		Energized Wire	Hands	Feet	Phone Leads	Earth	7620-13000	Foreman	63. Connecting leads to phone while they were being raised up pole on handline. Leads contacted pri.
FALL WITH POLE			Shoulder	Head & Body	Conductor	Earth	13200	Lineman	64. Pole broke off at grd. when wires were tied off; pole, victim & one tied-off wire fell to ground.
"A" FRAME			Arms	Feet	St.Lt.Standard	Earth	7200-12470	Laborer	65. Setting st.lt. standard. Bracket turned and contacted adjacent live circuit.
"A" FRAME			Arms	Feet	St.Lt.Standard	Earth	7200-12470	Laborer	66. Same as 65, double fatality.
TREE TRIMMING			Hands	R-Foot	Tree Limb	Tree Trunk	24500	Forester	67. Trimming adjacent to transmission line. Victim dislodged cut limb in contact with line.
TREE TRIMMING			L-Hand	Feet	Tree Limb	Tree	66000	Lineman	68. Tree limb, victim had cut, fell against live line.
CUSTOMER'S PROPERTY			Forehead	Forehead	Load Block	Dryer Case	110-220	Serviceman	69. Probably fainted while checking dryer. Fell between terminals and case.
CUSTOMER'S PROPERTY			L-Hand	—	Fuse Block	Test Lamp Clip	115-230	Meter Tester	70. Heart attack aggravated by electric shock. Attached 115V test lamp across 230V fuse block.

Review and Classification of 134 Fatal Accidents Reported During 1953
Within the Electric Light and Power Industry
Edison Electric Institute Accident Prevention Committee

(Continued)

			PATH OF CURRENT: VICTIM Entry	VICTIM Exit	EQUIPMENT Energized	EQUIPMENT Ground	Voltage	Occupation	DESCRIPTION
ELECTRIC SHOCK OR BURN CONT.	AT STATIONS ON OR AROUND EQUIPMENT BUS STRUCTURES ETC. 23 CASES	ENERGIZED BUSES 4 CASES	R-Hand	R-Elbow	Bus	Steel Girder	7200-12470	Foreman	71. Accidently contacted bus bars at substation.
			R-Shoulder	Foot	Bus	Steel Member	15000-26400	Mech. Helper	72. Assisting in inspection and maintenance of substation bus. Contact and fell.
			R-Shoulder	Head	Bus	Steel Tower	19000-33000	Mech. Helper	73. Pulling wire in conduit on steel structure. Failed to maintain clearance from live bus.
			R-Hand	Knees	Bus	Steel Struct.	19000-33000	Mechanic	74. Removing de-energized equipment from substation bay. Flipped lead into bus seven feet above.
		LINES, RISERS LEADS 9 CASES	L-Thumb	Chest	Sec. Wire	Sec. Wire	120-240	Electrician	75. Repairing live 240V wires feeding oil pumping outfit on truck without gloves. Received shock.
			Head	Feet	Dead End Clamp	Steel Struct.	1390-2400	Lineman	76. Contacted dead-end clamp while phasing in OCB at substation. Everything else covered.
			L-Hand	R-Hand	Pri. Wire	Steel Struct.	2300-4160	Lineman	77. Cutting over from 2300 to 4160V. Victim took hold of line entering substation he thought dead.
			L-Hand	R-Hand-L-Leg	Disc. Lead	Steel Struct.	2400-4160	App. Wireman	78. Substation partially de-energized. Victim started work before clearance was given.
			R-Hand	R-Foot	Disc. Lead	Floor	38000-66000	Asst. Operator	79. Changing OCB signal light. Fell from guard railing into bus.
			L-Hand	R-Foot	Conductor	Steel Struct.	7200	Elect. Foreman	80. Checking name plate data on equipment at de-energized substa. Contacted live incoming line.
			Forehead	Hands & Feet	Meter Lead	Trans. Stand	23000	Manager	81. Standing on metal trans. platform taking measurements. Made contact with 23KV lead.
			Hands	Feet	Trans. Riser	Trans. Case	34500	Foreman	82. Installing jumper in substa. End of jumper sprung away from victim & contacted riser in adj. bay.
			R-Hand	R-Leg	Sw. Bushing	Sw. Case	34500-69000	Electrician	83. Climbed structure to get nameplate data on OCB supposed dead. Contacted live bushing.
		DISCONNECTS 4 CASES	Hands	Body	Disc. Sw.	OCB Tank	2400-4160	Manager	84. Checking substation. Slipped or lost balance and fell against disconnect switches.
			R-Arm	L-Hand	Disc. Sw.	Steel Struct.	26000-44000	Maint. Man	85. Installing grounds on dead bus. Contact made on adjacent live disconnect.
			R-Hand	L-Arm	Air. Sw.	Steel Struct.	37000-66000	Helper	86. Extending substation bus. Victim climbed into roped-off area. Contacted disconnect switch.
			L-Wrist	Legs	Disc. Sw.	Steel Struct.	66000	Lineman	87. Replacing disconnect leads. Slipped from steel structure. Grabbed hot part of switch.
		FAULT CURRENT 2 CASES	L-Leg	Hands	Conduit	Conduit	13200	Troubleman	88. De-energized capacitors by opening fuses instead of OCB. Flash to conduit to man.
			L-Hand	L-Shoulder	Pole Grd.	Guy	7900-13800	Serviceman	89. Disc. flashed over when opened. Current passed from pole grd. thru body to guy.
		MISCELLANEOUS EQUIPMENT 4 CASES	R-Arm	L-Leg	Arrester	Grd. Wire	2400	Electrician	90. Had energized replaced arrester. For some unknown reason made contact.
			Hands	Feet	Record. Inst.	Earth	7200-12500	Engineer	91. Checking recording instruments alive at pri. voltage due to burned out current trans.
			R-Hand	Feet	Arrester	Pipe Rail	38000	Elect. Mech.	92. Removing lightning arresters from dead circuit; called away. Returned to L.A. on adjacent circuit.
			R-Shoulder	R-Foot	Trans. Case	Earth	41000-69000	Operator	93. Inexperienced relief operator contacted trans. case normally alive while reading gauge.
FALLS 18 CASES 13.4%	LINE WORK ON POLES OR TOWERS 15 CASES	FALL FROM POLE OR TOWER 9 CASES			Reason Undetermined			Foreman	94. Belting in to clear trouble. Fell 36' to ground.
					Lost Balance			Lineman	95. Had unbelted to descend pole. Fell 30' to ground.
					Slipped Thru Body Belt			Lineman	96. Coiling sec. service wires on pole. Fell 19' to ground.
					Fell While Belting In			Lineman	97. Climbed pole with wires hooked to belt. May have snapped on to wire instead of "D" ring.
					Cut Out On Pole			Lineman	98. Descending pole. Cut out and fell 20' to ground.
					Reason Undetermined			Lineman	99. Working on pole stringing new sec. system. Fell to ground.
					Safety Slipped Off End Of X-arm			Lineman	100. Belted to X-arm. Removed guy from end of arm exposing safety to end of arm.
					Slipped While Descending			Groundman	101. Fell 35' to ground while descending tower.
					Safety Disengaged			C&M Man	102. Belted to knee brace. Removed bolt from top of brace allowing brace to turn down out of safety.
		FALL WITH POLE 6 CASES						Lineman	103. Replacing rotted pole guyed four ways. Slacked off or cut three guys. Pole fell.
								Lineman	104. Stripping pole for removal. Pole broke below ground line. No test made before climbing.
								Lineman	105. Climbed pole set inside of sewer trench. Pole fell due to being set only 18" in ground.
								Lineman	106. "A" frame placed against rotted pole. Before hitch was made, pressure caused pole to break off & fall.
								Lineman	107. Transferring wires from old to new pole. Old pole broke off at ground line.
								Lineman	108. Removing pole from "A" frame structure. As top X-arm was removed, pole broke off at ground.
	MISC. 3 CASES	FALL WITH LADDER						Tree Trimmer	109. Cutting tree branch from ladder. Rope holding branch pulled ladder over.
		FALL FROM LOADING PLATFORM						Electrician	110. Assumed man fell from loading platform. Found on floor with fractured skull. Reasons for fall unknown.
		FALL FROM CONCRETE FOUNDATION						Painter	111. Man left work position and walked along conc. ledge. In passing pilaster, lost grip & fell 31'.
MOTOR VEHICLES 12 CASES 9.0%	ON HIGHWAY 11 CASES				Head on Collision	Time 9:00 AM		Serviceman	112. Trailer truck out of control crossed four-lane highway. Struck Company truck head-on.
					Head on Collision	Time 10:40 AM		Engineer	113. Driver attempting to kill spider crossed highway & struck Co. car throwing employee to pavement.
					Head on Collision	Time 1:50 PM		Supervisor	114. Trailer truck passing line of cars struck Company car head-on.
					Collision at Intersection	Time 9:15 AM		Asst. Engr.	115. Company car struck milk truck when latter had passed stop sign without stopping.
					Collision at Intersection	Time 10:01		Salesman	116. Company car entered unregulated intersection at 5 mph. Struck by fast moving car entering from right.
					Collision at Intersection	Time 4:07 PM		Truck Operator	117. Thrown from truck in collision at intersection on country road.
					Rear End Collision	Time 3:18 PM		Lineman	118. Thrown from Company truck after being struck in rear by another truck.
					Vehicle Left Road	Time 2:50 PM		Mechanic	119. Driving to work location. Right rear tire blew out.
					Vehicle Left Road	Time 9:45 AM		Repairman	120. Driving pickup on icy road. Skidded into bridge abutment.
					Vehicle Left Road	Time 3:50 AM		Serviceman	121. Truck mounted right-hand curb, rolled over and struck tree stump.
					Vehicle Left Road	Time 12:00 NOON		Special Agent	122. Car pulled off road due to flat tire and turned over.
	TRACTOR ON RIGHT-O-WAY				Tipped Over	Time 1:30 PM		Driver	123. Tractor upended on rough right-o-way. Operator unable to jump clear.
AIRCRAFT 1 CASE 0.75%	HELICOPTER				Struck Power Line and Crashed			Pilot	124. Making routine test of aircraft performance on transmission line patrol.
STRUCK BY 6 CASES 4.5%	LINE WORK				Struck by Falling Pole			Lineman	125. Derrick collapsed from over straining and dropped 85' pole on victim.
	LINE WORK				Struck by Truck Derrick Boom			Lineman	126. Boom on line truck being dismantled fell when pin was removed from stiff leg.
	LINE WORK				Struck by Truck Derrick Boom			Tree Trimmer	127. Watching crew dismantle derrick boom. When stiff-leg pin was pulled, boom swung and fell.
	MOVING				Struck by Crane Boom			Lineman	128. Moving crane around end of train at crossing. Drove off road. Tipped over striking man.
	PLANT MAINTENANCE				Struck by Flying Object			Maint. Man	129. Hand crank on hydro-gate left on. Flew off when motor started. Struck man's head.
	HAULING MATERIAL				Struck by Steel Bar			Laborer	130. Hauling tools on RR speeder. One end of bar caught on track; other end struck man.
SUFFOCATION 3 CASES 2.2%	ON HIGHWAY				Buried in Earth Slide			Laborer	131. Returning to camp from work. Three-man crew buried in earth slide on road.
	ON HIGHWAY				Buried in Earth Slide			Laborer	132. Same as 131 and 133, triple fatality.
	ON HIGHWAY				Buried in Earth Slide			Rod & Chainman	133. Same as 131 and 132, triple fatality.
BURNS 1 CASE 0.75%	STATION				Scalded by Hot Water			Maint. Man	134. Removing condenser tube. Leaky valve resulted in steam pocket. Victim scalded.

Compiled for E.E.I. Accident Prevention Committee
By S. M. Young

Personals

Walter E. Long, President and Director, The United Gas Improvement Co., has retired after more than 50 years of service with UGI and its former subsidiary, Philadelphia Electric Co. **Edward H. Smoker,** Vice President in Charge of Operations, has been named to succeed Mr. Long.

Another new appointment in the company is that of **W. D. McElroy,** Engineer, Operating Department, as Operating Manager.

Mr. Long joined Philadelphia Electric Co. in 1904 and was vice president in 1928 when it was acquired by UGI. He then became vice president of UGI and in 1943 was elected its president and director. During his years as president, to comply with the Public Utility Holding Company Act, UGI became an operating utility with divisions in Philadelphia and in many other of the large cities in the eastern part of Pennsylvania.

Mr. Smoker, a graduate of Franklin and Marshall College and the University of Cincinnati, joined UGI in 1930 as a research chemist and held various other positions prior to his appointment in 1950 as operating manager. He was elected vice president in 1953.

From his initial duties in 1928 as a technician in UGI's Physical Laboratory Mr. McElroy was promoted to manager of the Physical Laboratory and plant superintendent for UGI and the Ugite Sales Corp. For a five-year period, beginning in 1945, he was employed with the Pennsylvania Industrial Chemical Corp. and the Pittsburgh Consolidation Coal Co. Mr. McElroy returned to UGI in 1950 as engineer in the Operating Department. He is a graduate of West Virginia University.

Walter Bouldin, Financial Vice President, and **H. Neely Henry,** Vice President in Charge of Employee Relations, have been appointed Executive Vice Presidents of Alabama Power Co. The promotions were brought about by the retirement of **E. W. Robinson,** Vice President and General Manager.

Mr. Bouldin will become the executive vice president to whom the Treasury, Sales and Claims Departments will report. A graduate of the University of Alabama and Harvard Law School, he was connected from 1935 to 1952 with the law firm of Martin, Turner, Blakey and Bouldin where he was closely associated with the company's corporate and legal affairs.

Mr. Henry, who is a graduate of Virginia Military Institute, joined Alabama Power in 1924 as office engineer. He has been district superintendent, district manager, vice president and manager of the Industrial Development Department and assistant to the general manager. Mr. Henry will become the executive vice president to whom the Employee Relations, Land, Purchasing, Traffic and Office Buildings Department will report.

Mr. Robinson, who retires after 31 years of service, will be retained at the request of the company as a consultant to the Engineering and Construction Department, especially in the development of the company's projects on the Coosa and Warrior Rivers.

Paul P. Ashworth, General Manager, Telluride Power Co., has been advanced to the newly-created position of Executive Vice President. Named to succeed him was **O. C. McShane,** Assistant General Manager.

In his new position Mr. Ashworth will continue to have full supervision over the operations of the company but will devote himself particularly to company policy, system planning and power supply.

Mr. Ashworth joined the company in 1906 as a power plant operator. Later he was one of the first Telluride Association scholars at Cornell University, from which he was graduated in 1914.

Mr. McShane also started as a power plant operator when he became associated with Telluride in 1916. He has served four years each in the House and Senate of the Utah legislature.

J. D. Howard, Vice President in Charge of Operations, Wisconsin Power and Light Co., has been named Vice President in Charge of Engineering, System Operations and Maintenance to succeed **E. J. Kallevang,** who has retired following 44 years of service with the electric utility industry.

Mr. Howard joined the company in 1934, following nine years of employment with Westinghouse Electric Corp. He had graduated from Iowa State College and completed Westinghouse's three-year student training course before holding assignments for Westinghouse at Pittsburgh, Sharon, Philadelphia, Chicago, and Davenport. He joined WP&L as an industrial power engineer and served in various capacities until 1941 when he was given leave of absence to become district manager for the War Production Board.

After rejoining WP&L in 1943 as general sales manager, he served as acting district manager of the Beloit District prior to his election as vice president in charge of operations.

Mr. Kallevang has spent 39 years of his career with WP&L. A graduate of Highland Park College, he went to work in 1910 for the DeKalb-Sycamore Electric Railway Co. and in 1915 became chief engineer for the Southern Wisconsin Power Co., a predecessor of Wisconsin Power and Light. He continued with WP&L as chief engineer until his election this year as vice president in charge of engineering, system operations and maintenance.

Merritt A. Giles, General Supervisor of Operations, Pennsylvania Power Co., has been elected Vice President. A 30-year veteran in the utility industry, Mr. Giles was employed by Public Service Co. of Colorado and Ohio Public Service Co., and was serving as Division Superintendent of Electric Transmission and Distribution for Ohio Edison Co. when he resigned in 1951 to join Pennsylvania Power Co. He also was employed for one year as an examiner in the U. S. Patent Office. Mr. Giles is a graduate of the University of Wisconsin and studied law at George Washington University.

Two promotions which have been announced by West Penn Power Co. are those of **Lloyd R. Wagoner,** Sales Manager at Ridgway, to Western Division Sales Manager at Washington, and **Robert A. Mycoff,** Assistant Superintendent at the Springdale Power Station, to Operations Engi-

neer on the Pittsburgh headquarters power production staff.

Stewart G. Stalnecker, Assistant Treasurer, Public Service Electric and Gas Co., has succeeded **T. Wilson Van Middlesworth,** who has retired, as Treasurer. Named as an assistant treasurer was **Edward M. Forus,** Director of Educational Work.

Mr. Stalnecker, who has been an assistant treasurer since 1951, started with Public Service in 1928 as a commercial cadet. Other positions which he has filled for the company include those of statistical assistant to the vice president in charge of finance, assistant to the comptroller, and assistant comptroller. He holds degrees from the University of Pennsylvania and New York University.

Mr. Forus became associated with the company in 1940 as a commercial cadet. Upon completion of his cadet training he was assigned to the educational department as assistant to the director of educational work. He was made director of educational work in 1950. Mr. Forus, who holds degrees from Macallester College and New York University, served with the U. S. Army's Signal Corps during World War II.

Mr. Van Middlesworth started in the utility business in 1902 as a stenographer for the Essex and Hudson Gas Co., a predecessor company of Public Service. Subsequently he held the positions of secretary to the treasurer, stock transfer clerk, cashier, and assistant treasurer. He was made treasurer in 1917. In 1941, Mr. Van Middlesworth was elected to the boards of directors of Public Service Electric and Gas Co. and Public Service Coordinated Transportation. He will continue as a member of these boards after his retirement.

Edward W. Hodgetts, Assistant Manager of The Cincinnati Gas & Electric Co.'s Electric Sales Department, has been appointed Director of Promotion, Advertising and Publicity. The company's new Director of Community Relations will be **George J. Kuehnle, Jr.,** Manager of the Northern Division. Succeeding Mr. Kuehnle will be **William K. Robinson,** Industrial Development Representative.

Mr. Hodgetts started to work for the company in 1928 in the Electric Sales Department where he was engaged in lighting sales promotion. He was appointed assistant manager of the Publicity Department in 1946 and in 1950 was made assistant manager of the Electric Sales Department in charge of sales promotion, display and dealer sales.

In his new job Mr. Kuehnle will direct community relations for the company's Kentucky, Northern and Eastern Divisions outside of Cincinnati. He has been with the company since 1923 and is a graduate of the University of Cincinnati.

Mr. Robinson, associated with the company since 1946, is a graduate of Ohio Wesleyan University and the Harvard School of Business.

Leland B. Bonnett, Vice President, Consolidated Edison Co. of New York, Inc., has retired after 31 years with the company. At the time of his retirement, Mr. Bonnett was in charge of design engineering. Positions he has held with Con Edison and Brooklyn Edison Co., prior to its merger with Con Edison, include inside plant engineer, purchasing agent, assistant engineer of design and planning, vice president in charge of engineering, purchasing and stores.

He is president of the Engineers Club of New York and a director of the American Gas Association and the Regional Plan Association of New York. He also holds membership in the AIEE, ASME, and New York State Society of Professional Engineers.

Lawrence J. Donley, Assistant Advertising Manager, Northern States Power Co., has been named Advertising Manager to succeed **Thomas H. Kettle,** who has retired after 40 years of service with the company.

Mr. Donley joined NSP in 1928 as assistant advertising manager and at that time assumed responsibility for the creation and production of the company's advertising. Since 1929, NSP advertising has won 54 awards, including the top-ranking Harvard University Advertising Award.

Mr. Kettle joined the then Minneapolis General Electric Co. in 1914 as assistant to the sales manager, coming to Minneapolis from the Toronto Hydro-Electric Power System. He was named advertising manager in 1917. He is a past director of the Public Utilities Advertising Association, in which he has been active for many years.

M. H. Rodger, Utility and Special Account Sales Manager, Crosley-Bendix Division of Avco Corp. at Cincinnati, has rejoined Middle West Service Co. as Senior Consultant in Sales Management. Mr. Rodger was with Middle West from 1938 until 1945 when he became utility sales manager for Bendix Home Laundry Co. at South Bend, Ind. Subsequently he was sales manager for Crosley's Laundry Equipment Department and has been utilities and special accounts sales manager since Crosley and Bendix were consolidated.

L. W. Coughlan, Assistant Comptroller, Pacific Gas and Electric Co., has been appointed Comptroller, succeeding retired **E. W. Hodges.**

Mr. Coughlan began with PG and E in 1916 as a clerk. Prior to becoming assistant comptroller in 1954, he had served the company in several auditing and accounting positions, including those of chief clerk in the San Francisco General Office Auditing Department and general auditor.

Mr. Hodges, who served as comptroller for 27 years, joined the company in 1917 and worked in the Auditing Department. He was made general auditor in 1921, in which position he worked for six years before assuming his last position.

William R. Wise, Superintendent of New York State Electric & Gas Corp.'s Hickling Station, has been appointed Superintendent of the company's new 135,000-kw Milliken Station. He has been succeeded at Hickling by **F. Douglas Moulton,** Test Engineer. **James J. Case,** Results Engineer, has been appointed Test Engineer to succeed Mr. Moulton.

Mr. Wise started with the company in 1937 as a plant foreman. He became chemist and test engineer in 1941 and was appointed to his previous post in 1947.

Mr. Moulton joined the company in 1936 and served as chemist and test engineer at the Goudey Station until being transferred as test engineer to Hickling in 1948.

Mr. Case was employed by the company in 1952 as a cadet engineer and was made results engineer in 1954.

EDISON ELECTRIC INSTITUTE OFFICERS AND COMMITTEES

OFFICERS

HAROLD QUINTON, *President* ..... Southern California Edison Co., Los Angeles, Calif.
HARLLEE BRANCH, JR., *Vice President* ..... Georgia Power Co., Atlanta, Ga.
H. S. BENNION, *Vice President and Managing Director* .... 420 Lexington Avenue, New York, N. Y.
H. S. SUTTON, *Treasurer* ..... Consolidated Edison Co. of New York, Inc., New York, N. Y.
A. B. MORGAN, *Secretary and Assistant Managing Director* 420 Lexington Avenue, New York, N. Y.

BOARD OF DIRECTORS

(Terms Expiring 1955)

A. D. BARNEY ..... The Hartford Electric Light Co., Hartford, Conn.
G. M. GADSBY ..... Utah Power & Light Co., Salt Lake City, Utah
C. B. DELAFIELD ..... Consolidated Edison Co. of New York, Inc., New York, N. Y.
ALLEN S. KING ..... Northern States Power Co., Minneapolis, Minn.
EARLE J. MACHOLD ..... Niagara Mohawk Power Corp., Syracuse, N. Y.
PAUL B. MCKEE ..... Pacific Power & Light Co., Portland, Ore.
S. C. MCMEEKIN ..... South Carolina Electric & Gas Co., Columbia, S. C.
GROVER C. NEFF ..... Wisconsin Power and Light Co., Madison, Wis.
P. H. POWERS ..... West Penn Power Co., Pittsburgh, Pa.
R. G. RINCLIFFE ..... Philadelphia Electric Co., Philadelphia, Pa.
WALTER H. SAMMIS ..... Ohio Edison Co., Akron, Ohio
C. V. SORENSON ..... Indiana & Michigan Electric Co., Ft. Wayne, Ind.
N. R. SUTHERLAND ..... Pacific Gas and Electric Co., San Francisco, Calif.
J. B. THOMAS ..... Texas Electric Service Co., Ft. Worth, Tex.
ALLEN VAN WYCK ..... Illinois Power Co., Decatur, Ill.

(Terms Expiring 1956)

D. E. ACKERS ..... The Kansas Power and Light Co., Topeka, Kan.
W. C. BECKJORD ..... The Cincinnati Gas & Electric Co., Cincinnati, Ohio
JOSEPH M. BELL, JR. ..... New York State Electric & Gas Corp., Binghamton, N. Y.
WALKER L. CISLER ..... The Detroit Edison Co., Detroit, Mich.
B. L. ENGLAND ..... Atlantic City Electric Co., Atlantic City, N. J.
J. G. HOLTZCLAW ..... Virginia Electric and Power Co., Richmond, Va.
R. K. LANE ..... Public Service Co. of Oklahoma, Tulsa, Okla.
P. H. MCCANCE ..... Duquesne Light Co., Pittsburgh, Pa.
R. E. MOODY ..... Union Electric Co. of Missouri, St. Louis, Mo.
HARRY B. MUNSELL ..... Kansas City Power & Light Co., Kansas City, Mo.
O. TITUS ..... Pennsylvania Electric Co., Johnstown, Pa.
W. O. TURNER ..... Louisiana Power & Light Co., New Orleans, La.
G. W. VAN DERZEE ..... Wisconsin Electric Power Co., Milwaukee, Wis.
WILLIAM WEBSTER ..... New England Electric System, Boston, Mass.
FRANK M. WILKES ..... Southwestern Gas and Electric Co., Shreveport, La.

(Terms Expiring 1957)

R. P. BRIGGS ..... Consumers Power Co., Jackson, Mich.
W. J. CLAPP ..... Florida Power Corp., St. Petersburg, Fla.
J. E. CORETTE ..... The Montana Power Co., Butte, Mont.
C. P. CRANE ..... Consolidated Gas Electric Light and Power Co. of Baltimore, Baltimore, Md.
A. S. CUMMINS ..... The California Oregon Power Co., Medford, Ore.
THOMAS G. DIGNAN ..... Boston Edison Co., Boston, Mass.
E. W. DOEBLER ..... Long Island Lighting Co., Mineola, N. Y.
JOHN W. EVERS ..... Commonwealth Edison Co., Chicago, Ill.
C. E. IDE ..... The Toledo Edison Co., Toledo, Ohio
S. R. KNAPP ..... The Connecticut Light & Power Co., Berlin, Conn.
C. B. MCMANUS ..... The Southern Co., Inc., Atlanta, Ga.
R. S. NELSON ..... Gulf States Utilities Co., Beaumont, Texas
W. A. PARISH ..... Houston Lighting & Power Co., Houston, Texas
HAROLD QUINTON ..... Southern California Edison Co., Los Angeles, Calif.
L. V. SUTTON ..... Carolina Power & Light Co., Raleigh, N. C.

Executive Committee

A. D. Barney, Walker L. Cisler, C. B. Delafield, P. H. Powers, R. G. Rincliffe, W. H. Sammis, L. V. Sutton, G. W. Van Derzee, William Webster.

EDISON ELECTRIC INSTITUTE OFFICERS AND COMMITTEES

ADVISORY COMMITTEE (1954-1955)

D. C. BARNES .....Virginia Electric and Power Co., Charlottesville, Va.
J. B. BLACK.....Pacific Gas and Electric Co., San Francisco, Calif.
CURTIS E. CALDER.....Electric Bond and Share Co., New York, N. Y.
EDGAR H. DIXON.....Middle South Utilities, Inc., New York, N. Y.
PHILIP A. FLEGER..Duquesne Light Co., Pittsburgh, Pa.
WILLIS GALE..Commonwealth Edison Co., Chicago, Ill.
E. L. LINDSETH.The Cleveland Electric Illuminating Co. Cleveland, Ohio
H. P. LIVERSIDGE.....Philadelphia Electric Co., Philadelphia, Pa.
J. E. LOISEAU.....Public Service Co. of Colorado, Denver, Colo.
J. W. MCAFEE.....Union Electric Co. of Missouri, St. Louis, Mo.
LYLE MCDONALD..Public Service Electric and Gas Co., Newark, N. J.
GEORGE L. MACGREGOR.....Texas Utilities Co., Dallas, Texas
I. L. MOORE.....New England Electric System, Boston, Mass.
W. C. MULLENDORE..Southern California Edison Co., Los Angeles, Calif.
C. E. OAKES.....Pennsylvania Power & Light Co., Allentown, Pa.
J. S. OSBORNE..Central & South West Corp., Chicago, Ill.
KINSEY M. ROBINSON...The Washington Water Power Co., Spokane, Wash.
WILLIAM SCHMIDT, JR.....Consolidated Gas Electric Light and Power Co. of Baltimore, Baltimore, Md.
H. R. SEARING.....Consolidated Edison Co. of New York, Inc., New York, N. Y.
MCGREGOR SMITH.....Florida Power & Light Co., Miami, Fla.
PHILIP SPORN..American Gas and Electric Service Corp., New York, N. Y.
FRANK M. TAIT....The Dayton Power and Light Co., Dayton, Ohio
E. S. THOMPSON...The West Penn Electric Co. (Inc.), New York, N. Y.
J. R. WHITING...Consumers Power Co., Jackson, Mich.

CHAIRMEN OF EDISON ELECTRIC INSTITUTE COMMITTEES (1954-1955)

ACCOUNTING

Accounting Division Executive, O. K. BOYD....Consolidated Gas Electric Light and Power Co. of Baltimore, Baltimore, Md.
Coordinator of Customer Activities, F. J. PORTER, JR.....Consolidated Edison Co., of New York, Inc., New York, N. Y.
Customer Accounting, S. A. COLE.....New York State Electric & Gas Corp., Ithaca, N. Y.
Customer Collections, A. H. MAYER.....Consolidated Edison Co. of New York, Inc., New York, N. Y.
Customer Relations, T. J. PETERSON.....The Detroit Edison Co., Detroit, Mich.
Coordinator of General Activities, W. T. HAMILTON.....The Cleveland Electric Illuminating Co., Cleveland, Ohio
Depreciation Accounting, C. N. RICE, JR.....Northern States Power Co., Minneapolis, Minn.
General Accounting, C. T. DWIGHT.....The Hartford Electric Light Co., Hartford, Conn.
Internal Auditing, G. G. BECHER.....The Dayton Power and Light Co., Dayton, Ohio
Plant Accounting and Records, F. W. ROSS.....Pennsylvania Power & Light Co., Allentown, Pa.
Taxation Accounting, C. A. PALMGREN, JR.....New Orleans Public Service Inc., New Orleans, La.

COMMERCIAL

Commercial Division Executive, O. R. DOHRR.....Pacific Gas and Electric Co., San Francisco, Calif.
Commercial Sales Group, R. W. BUTTS.....Ohio Edison Co., Akron, Ohio
Farm Group, BUD S. MOSS.....Georgia Power Co., Atlanta, Ga.
Industrial Power and Heating Group, G. S. YOUNG.....Kansas City Power & Light Co., Kansas City, Mo.
Residential Group, H. H. BRENAN.....Pennsylvania Power & Light Co., Allentown, Pa.
Special Service Group, F. C. PESVEYC.....Public Service Electric and Gas Co., Newark, N. J.

ENGINEERING

Engineering Division General, E. L. HOUGH.....Union Electric Co. of Missouri, St. Louis, Mo.
Electrical Equipment, C. L. DERRICK.....The Hartford Electric Light Co., Hartford, Conn.
Hydraulic Power, P. M. HESS.....Pennsylvania Water & Power Co., Lancaster, Pa.
Meter and Service, C. V. MOREY.....Consolidated Edison Co. of New York, Inc., New York, N. Y.
Prime Movers, W. L. CHADWICK.....Southern California Edison Co., Los Angeles, Calif.
Transmission and Distribution, J. W. ANDERSON.....Philadelphia Electric Co., Philadelphia, Pa.

GENERAL

Accident Prevention, R. P. DOUGLAS.....The Detroit Edison Co., Detroit, Mich.
Area Development, W. I. DOLBEARE.....Virginia Electric and Power Co., Richmond, Va.
Atomic Power, EDGAR H. DIXON.....Middle South Utilities, Inc., New York, N. Y.
Codes and Standards, E. W. DOEBLER.....Long Island Lighting Co., Mineola, N. Y.
Electric Power Survey, ARTHUR S. GRISWOLD.....The Detroit Edison Co., Detroit, Mich.
Financing and Investor Relations, H. A. BUSCH.....General Public Utilities Corp., New York, N. Y.
Industrial Relations, F. R. RAUCH.....The Cincinnati Gas & Electric Co., Cincinnati, Ohio
Insurance, WALTER O. RANDLETT.....Virginia Electric and Power Co., Richmond, Va.
Legal, D. BRUCE MANSFIELD.....Ohio Edison Co., Akron, Ohio
Membership, E. S. THOMPSON.....The West Penn Electric Co. (Inc.), New York, N. Y.
Prize Awards, HARRY RESTOFSKI.....West Penn Power Co., Pittsburgh, Pa.
Purchasing and Stores, J. D. HOGG.....The Cleveland Electric Illuminating Co., Cleveland, Ohio
Rate Research, C. A. WILLIAMS.....The United Illuminating Co., New Haven, Conn.
Regulation, HARLLEE BRANCH, JR.....Georgia Power Co., Atlanta, Ga.
Research Advisory, R. E. MOODY.....Union Electric Co. of Missouri, St. Louis, Mo.
Research Projects, C. W. FRANKLIN.....Consolidated Edison Co. of New York, Inc., New York, N. Y.
Statistical, ROY F. CRIM.....West Penn Power Co., Pittsburgh, Pa.
Tax Policy, R. P. BRIGGS.....Consumers Power Co., Jackson, Mich.
Technical Exchange for Overseas Visitors, HARVEY E. BUMGARDNER.....The Detroit Edison Co., Detroit, Mich.
Transportation, RANDOLPH WHITFIELD.....Georgia Power Co., Atlanta, Ga.